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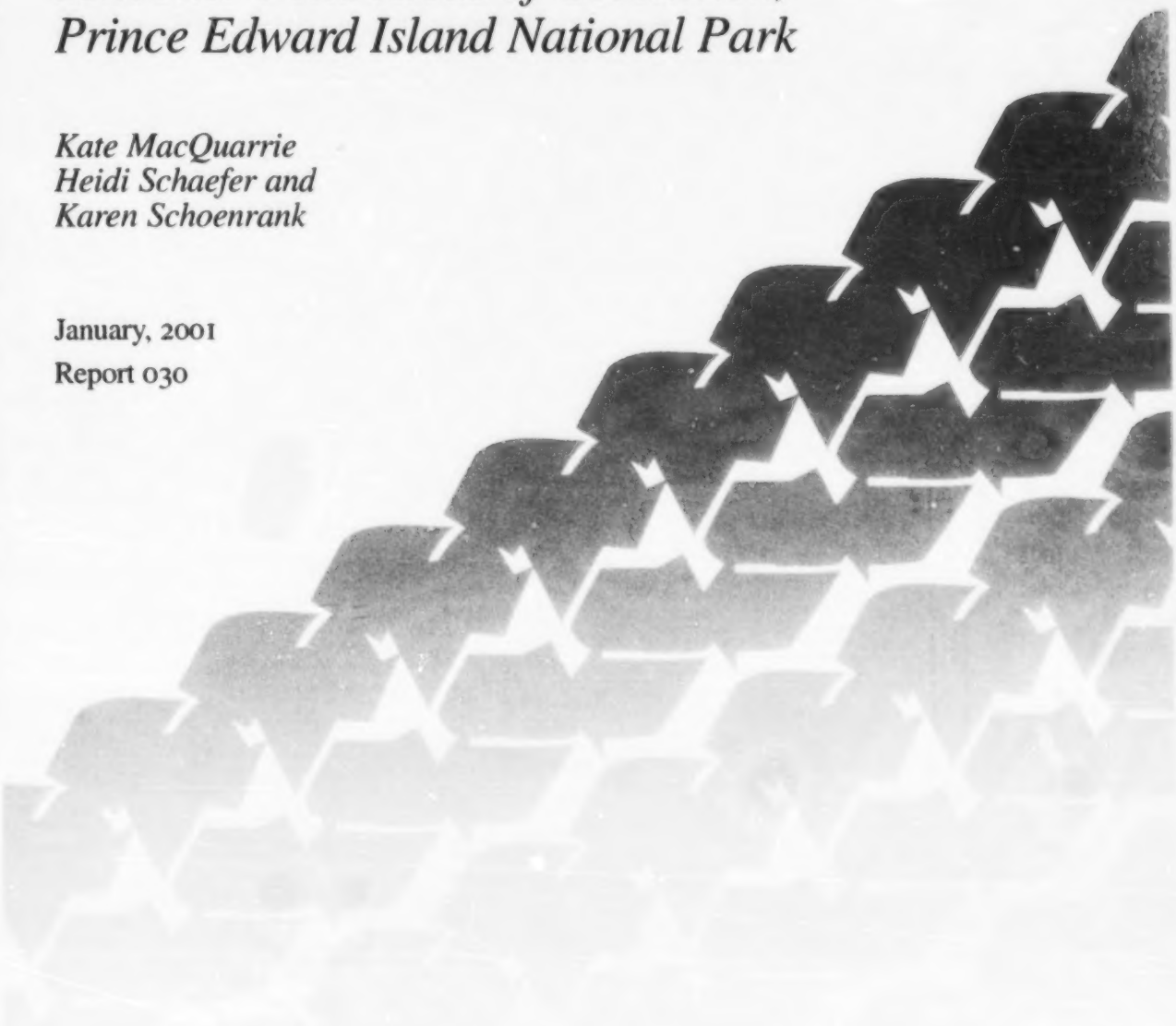
A Floral Inventory of the Central and Schooner Pond Areas of Greenwich, Prince Edward Island National Park

Kate MacQuarrie
Heidi Schaefer and
Karen Schoenrank

January, 2001
Report 030



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Abstract

The vascular plants of the Central and Schooner Pond Areas of Greenwich, Prince Edward Island National Park were inventoried during summer 1999. A total of 272 species was identified in sand dune, forest, wetland and old field habitats, with forest showing the greatest species diversity. Total species identified were classed into provincially common (191), uncommon (56), rare (10) and very rare (13); the status of the remaining two species is unknown on Prince Edward Island. Twenty-two percent of species were classed as introduced, a proportion slightly lower than the provincial figure; Long Pond was found to have no introduced species. Fifty-nine species have not been recorded previously at Greenwich, and one species has no published record to document its presence on Prince Edward Island. A comparison of the 1998 and pre-1998 vascular floral inventories at Greenwich, Prince Edward Island National Park suggests that the site's four ponds are botanically distinct from each other despite close geographical proximity. Recommendations for protection and presentation of Greenwich are included.

Résumé

Les plantes vasculaires des aires du centre et de l'étang Schooner du secteur Greenwich du parc national de l'Île-du-Prince-Édouard ont été inventoriées au cours de l'été 1999. On en a dénombré 272 espèces dans les dunes, les forêts, les terres humides et les champs abandonnés, et c'est dans la forêt que se trouve la plus grande diversité. Les espèces identifiées ont été classées comme suit quant à leur fréquence dans la province : communes (191), occasionnelles (56), rares (10) et très rares (13); la fréquence des deux autres espèces n'est pas connue à l'Île-du-Prince-Édouard. Vingt-deux pour cent des espèces sont introduites, soit une proportion légèrement inférieure à celle des espèces introduites dans l'ensemble de la province; il n'y a aucune espèce introduite dans le secteur de l'étang Long. Cinquante-neuf espèces n'ont jamais été recensées auparavant à Greenwich, et une espèce n'a jamais été enregistrée officiellement à l'Île-du-Prince-Édouard. La comparaison avec les inventaires de la flore vasculaire dressés en 1998 et antérieurement dans le secteur Greenwich du parc national de l'Île-du-Prince-Édouard laisse entendre que, malgré leur proximité, les quatre étangs du secteur ont chacun une flore bien distincte. Ci-inclus des recommandations pour la protection et la mise en valeur de Greenwich.

Acknowledgements

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INTRODUCTION

Located approximately 60 kilometres northeast of Charlottetown on the north shore of Kings County, Prince Edward Island, the Greenwich peninsula forms a gently rolling point of land separating St. Peter's Bay from the Gulf of St. Lawrence (Figure 1). While most of the land base of the peninsula is agricultural, an area of 625 hectares (ha) at the tip includes an extensive sand dune system with associated woodlands, wetlands and old fields.

Sand dunes are a relatively uncommon feature of Prince Edward Island, comprising 3,471 ha (0.6%) of the landscape (Dibblee, in prep.). Within this habitat type the Greenwich dunes are unique, having at least eight features of local, national or international importance (MacQuarrie, 1996). For this reason, the Government of Prince Edward Island acquired land at the tip of the peninsula in 1995 and deeded this and two other provincially-owned parcels to the Government of Canada in 1998 for inclusion in Prince Edward Island National Park. These three disjunct parcels are referred to as the Western, Central and Schooner Pond Areas respectively (Figure 1) and comprise Greenwich, Prince Edward Island National Park.

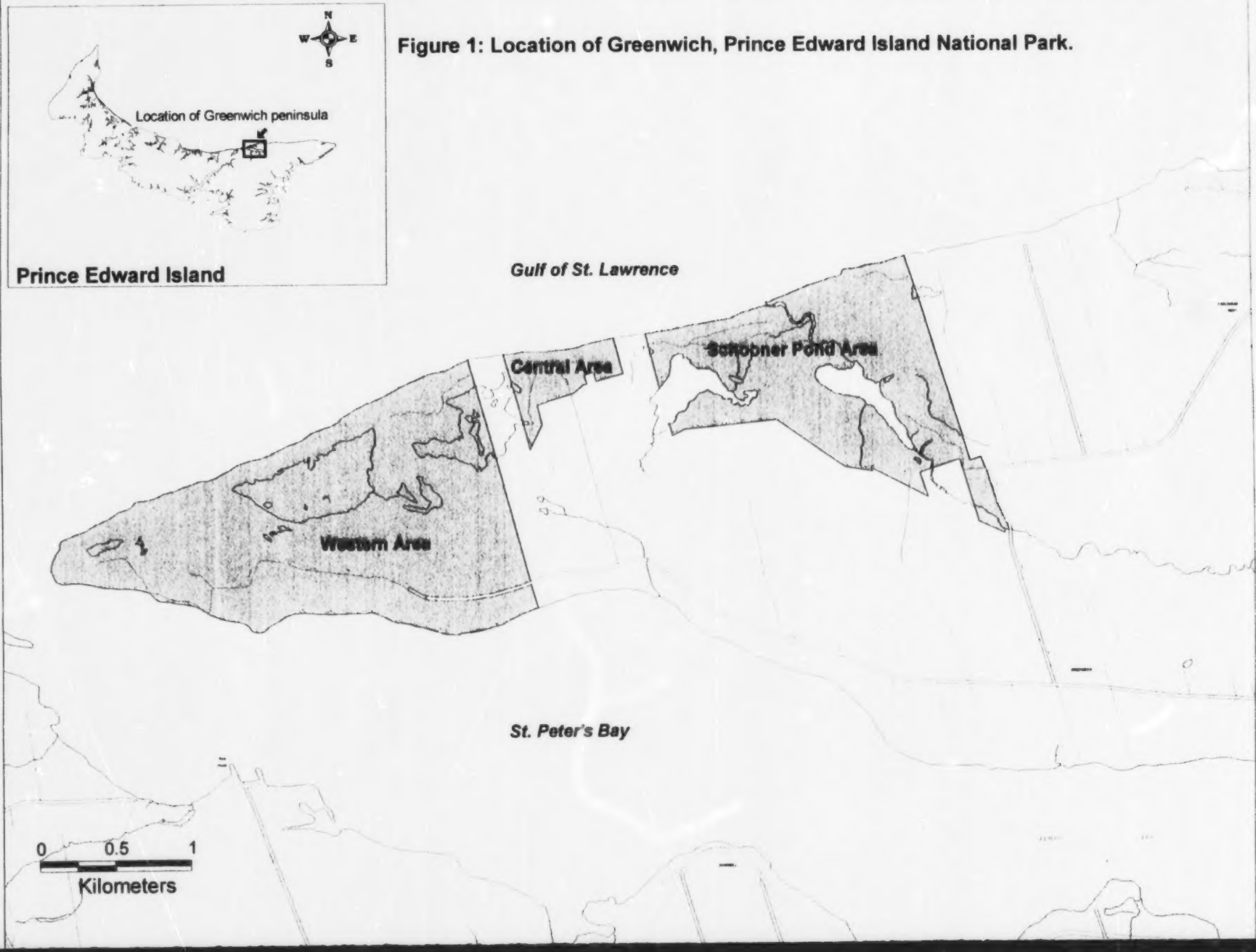
A 1998 floral inventory of the Western Area revealed the presence of 293 species, including 99 that had not been previously recorded at Greenwich (MacQuarrie, Schaefer and Schoenrank, 1999). This study is a continuation of the 1998 research.

STUDY AREA

The Central and Schooner Pond properties comprise the study area. The 24 ha Central Area includes approximately 15.5 ha of sand dune, 5 ha of primarily coniferous forest, 3 ha of regenerating agricultural land and 0.50 ha of wetland (Figure 2).

The 177 ha Schooner Pond Area includes approximately 87.5 ha of sand dune, 43.25 ha of open water pond and associated wetland, and 46.25 ha of mixed coniferous and deciduous forest (Figure 2). This easternmost area of PEI National Park encompasses all of the 20 ha Schooner Pond and three-quarters of the 31 ha Long Pond.

The Central and Schooner Pond Areas are separated from each other and from the larger Western Area by two privately-owned parcels with frontage on both the north and south shores of the peninsula. The parcel east of the Central Area includes the western portion of Long Pond, as well as some agricultural land. Approximately half of the land west of the Central Area is active agricultural land; the remainder includes woodland and the eastern portion of Bog Pond (Figure 2). Both private properties include permanent, occupied dwellings. These lands provide an avenue for private beach access as well as for activities such as vehicle use and cottage development that may not conform or be compatible with National Park uses.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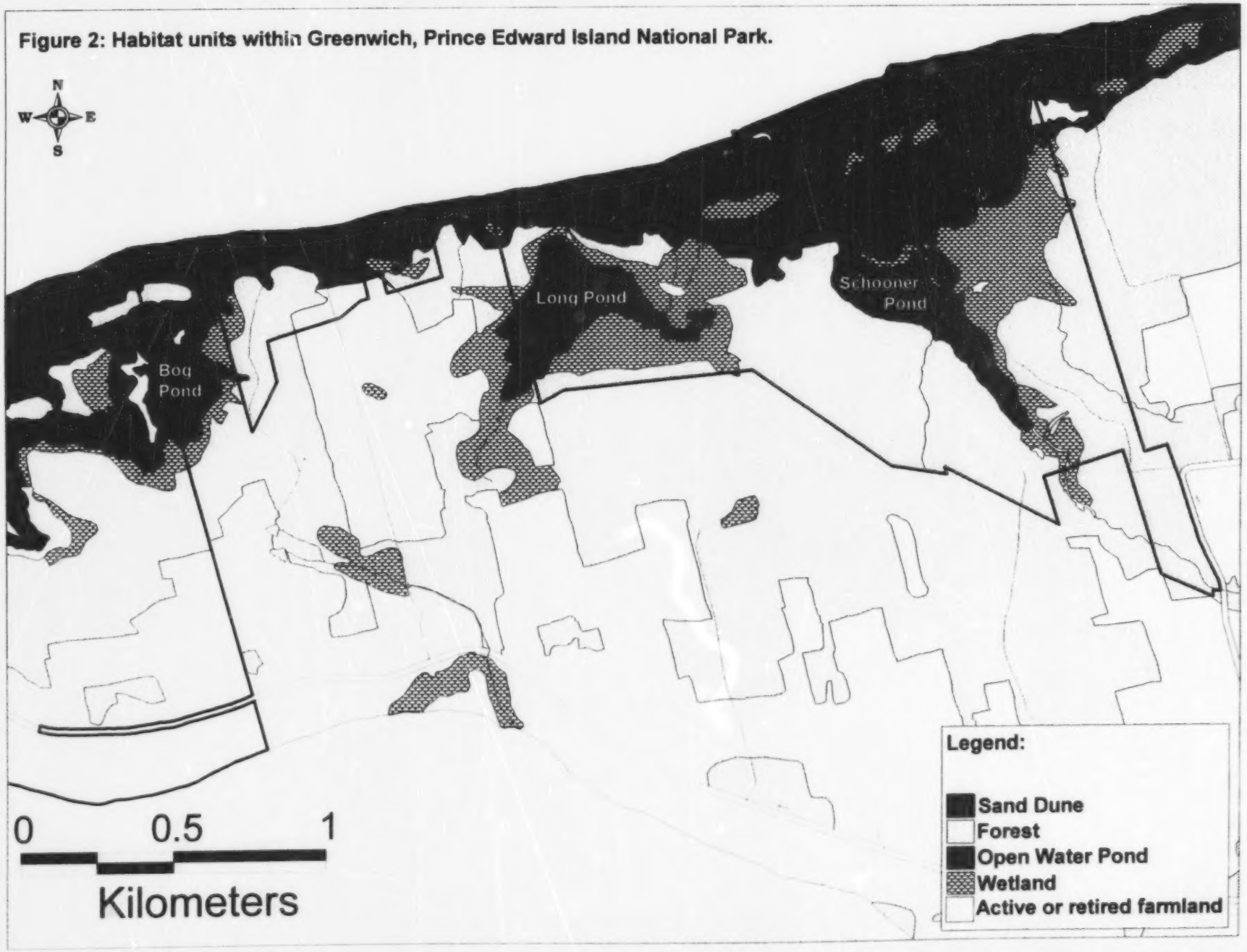
W
E
S
Location of Greenwich peninsula
Prince Edward Island
Figure 1: Location of Greenwich, Prince Edward Island National Park.
Gulf of St. Lawrence
Central Area
Schooner Pond Area
Western Area
St. Peter's Bay
0
0.5
1
Kilometers

Figure 2: Habitat units within Greenwich, Prince Edward Island National Park.



Part of the Central Area was actively farmed until 1998, and there is a historical record of occupation of at least part of the Schooner Pond Area. The 1880 atlas of Prince Edward Island shows two dwellings that appear to be within what is now the Park boundary, and a church in the immediate area (Meacham, 1880). The sand dunes in both areas show evidence of vehicle traffic, in some places quite recent. The wetlands in both areas were used by hunters and trappers until the land was transferred to Parks Canada in 1998. Anglers continue to use Schooner Pond, which is the only Greenwich pond that is clearly stream fed and has an outlet to the Gulf of St. Lawrence. As such, it is the only pond affected by tidal influences, and has runs of brook trout and gaspereaux.

Signs of the provincially rare Pileated Woodpecker (*Dryocopus pileatus*) were found in the forest of the Schooner Pond Area in the 1980s (Island Nature Trust, unpublished information). The internationally endangered Piping Plover (*Charadrius melodus*) nested unsuccessfully on the north shore of the Schooner Pond Area in 1998; a pair successfully fledged one chick here in 1999.

Although the Central and Schooner Pond Areas do not include the parabolic dunes, counter-ridges, skeletal forest and known archaeological sites that make Greenwich a site of international importance, they are significant on their own.

The north shore sand dunes are contiguous and intact, and with the exception of the previously-mentioned vehicle tracks, do not show the damage of more heavily visited systems on the Island. Long and Schooner Ponds, when combined with the Western Area's Bowley and Bog Ponds, form the second most biologically important feature at Greenwich, after the area's internationally significant sand dunes (Guignion, 1975; MacQuarrie, 1996). The extent of early human occupation of the Greenwich peninsula is not known, and Paleo-Indian or early Mi'Kmaq use in this area could well have extended to these parcels (Island Nature Trust, unpublished information).

PREVIOUS FIELD STUDIES

Twenty seven field surveys were conducted at Greenwich between 1970 and 1998: 14 avifaunal, eight floral, three archaeological, one entomological and one physical (soils). All but one were conducted in what is now the Western Area. A single unpublished and informal report was found for the Schooner Pond Area, in relation to a search for Pileated Woodpecker in the forest there.

MATERIALS AND METHODS

Methodology primarily followed that of MacQuarrie *et al*, 1999, to ensure consistency and allow results from all three parcels at Greenwich to be compared.

Five-metre wide transects were established on an azimuth of magnetic north in response to the east-west alignment of the site's macro- and micro-habitats. Transects were spaced 50 metres apart (Figures 3 and 4), although it is important to note that in uniform habitats such as the Schooner Pond sand dunes, sampling frequency was decreased to every second or third transect. Additionally, the area east of Schooner Creek was surveyed east/west in response to the pattern of microhabitats at that location.

Figure 3: Locations of floral survey transects and rare species within the Central Area of Greenwich, Prince Edward Island National Park.

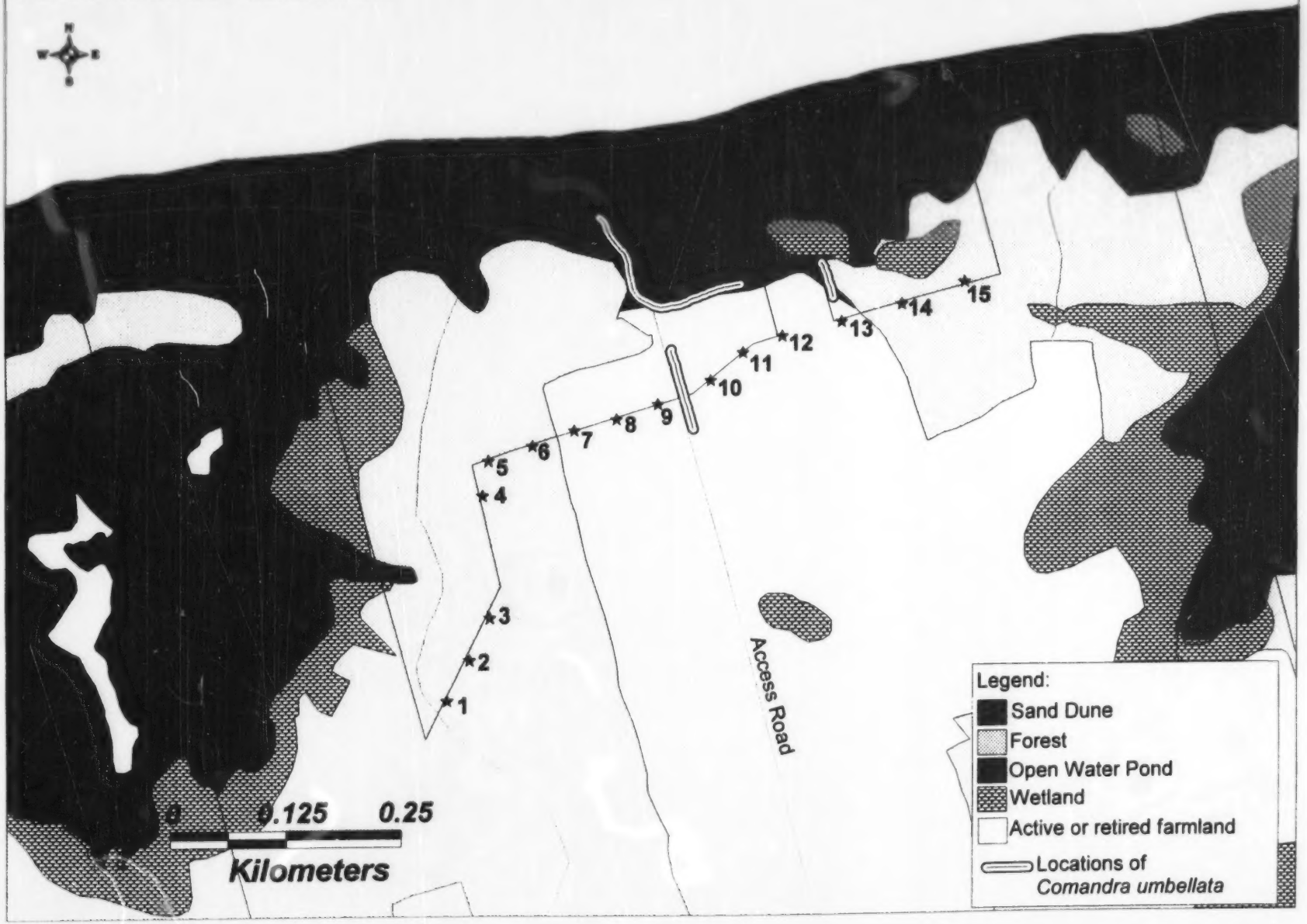
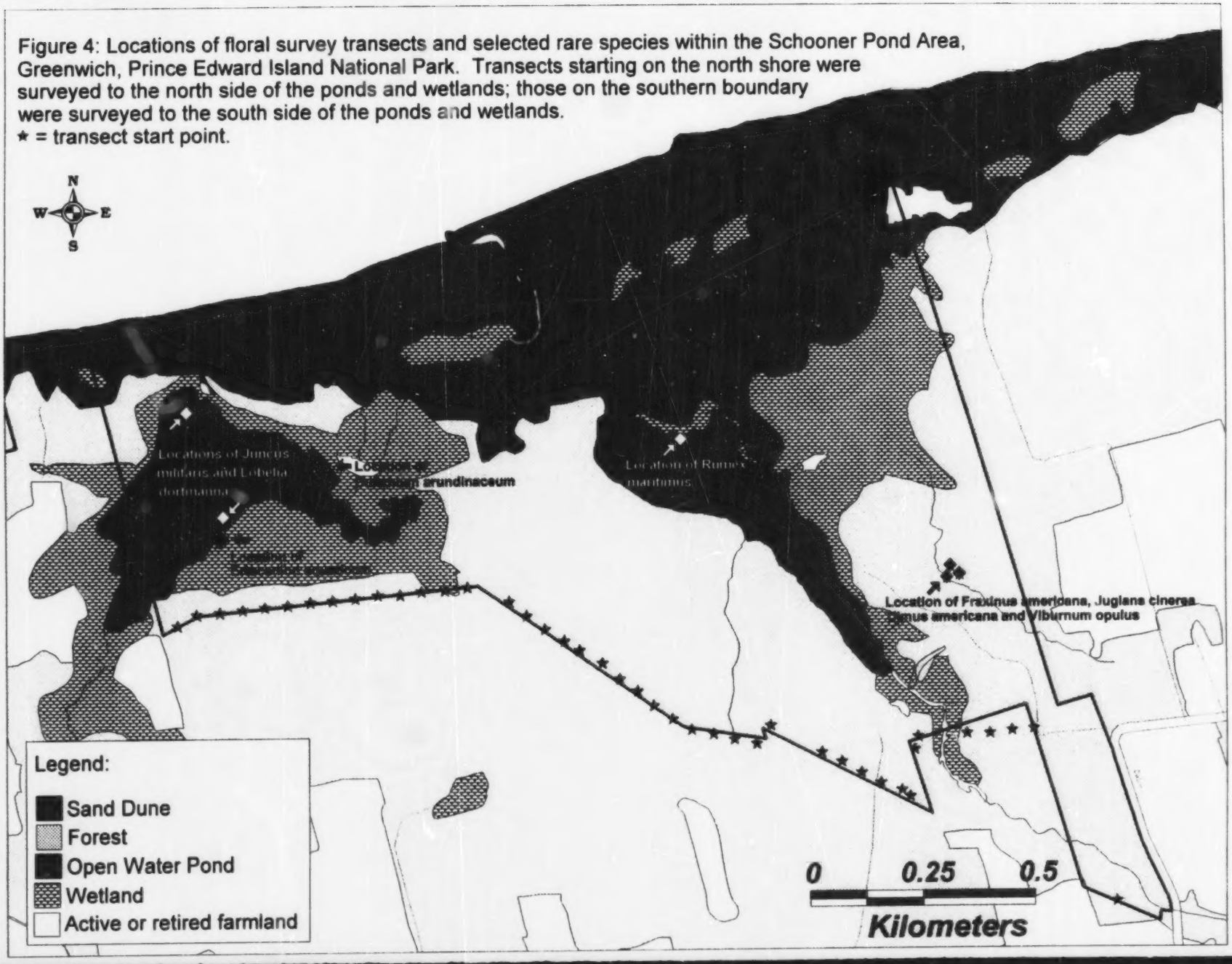


Figure 4: Locations of floral survey transects and selected rare species within the Schooner Pond Area, Greenwich, Prince Edward Island National Park. Transects starting on the north shore were surveyed to the north side of the ponds and wetlands; those on the southern boundary were surveyed to the south side of the ponds and wetlands.
★ = transect start point.



Because of water depth and the presence of sink holes, Long and Schooner Ponds could not be safely crossed on foot. These areas were not surveyed by transect, but rather by surveyors in canoe who recorded submerged, emergent and terrestrial vegetation in and around the ponds. Species identification methods and record keeping were identical to those used on transects.

To establish the transects, the south end of each woodland transect was marked with field tape securely tied to vegetation and labelled INT99 #, with # being the transect number. In sand dune and field areas, labelled agricultural field flags were used to mark transect start points.

Surveying began at the south end of the westernmost transect. Using a compass, surveyors followed a magnetic north bearing and recorded all plants located within the transect, as well as noteworthy species observed off the transect.

Transect start points and locations of rare plants and communities were recorded in latitude/longitude with a real-time differential Geographic Positioning System with an error of less than +/- 1 metre (Trimble 12 ch Pro XR GPS/Beacon TSC1) and are mapped in Figures 3 and 4. Several of the field markers in the Schooner Pond dune could not be located at the time of GPS recording, resulting in the gaps in Figure 4.

Records consisted of a list of all species found within each transect and notable species found outside the transect. Samples of species that could not be immediately recognized were taken and identified using a variety of floral keys, primarily *Roland's Flora of Nova Scotia* (Zinck, 1998). Species not positively identified were dried, mounted and forwarded to experts for identification or verification.

Systematic transect surveys began in late May and continued until early August, 1999. Transects visited early in the study were visited again later in the field season to allow identification of later emerging species. Because construction of Park infrastructure in the Central Area began before surveyors had revisited these transects, Central Area transects 9 and 10 were surveyed only once, early in the season.

Upon completion of transect and pond surveys, irregular habitats and areas in which rare plants were likely to be found were targeted. Anomalous habitats were identified through aerial photographs and anecdotal evidence from area residents. These areas were thoroughly surveyed, with plant identification and record keeping identical to transect work.

Habitat diversity was measured by species count. An index of abundance was used to assess how common each species was in each habitat of the study area, and was measured by the number of transects on which each species was found. As researchers could not confirm an accepted standard for assessment of abundance, the following criteria were chosen: species found on 50-100% of transects within a single habitat were classed as common to the site, species occurring on 25-49% were classed as uncommon, those found on 5-24% were classed as rare, and those restricted to fewer than 5% of the transects in a particular habitat were classed as very rare in that habitat.

In the wetland habitats, common species were those found in or around three or four wetland locations (ponds and associated streams), uncommon species were those found in or around two locations, and rare species were found in a single location.

Floral status on PEI was determined according to *The Plants of Prince Edward Island* (Erskine, revised 1985). Plants found by Erskine at 13 or more stations Island-wide were classed as common, while those found at five to 12 stations or restricted to a single region of the Island were classed uncommon, and those found at four or fewer stations were classed as rare. Plants listed in *The Rare Vascular Plants of Prince Edward Island* (Day and Catling, 1991) were classed as very rare.

Based on regional references (eg. Erskine, revised 1985; Hinds, 1986; Zinck, 1998), species known to have reached Atlantic Canada after European settlement (c.1720) were classed as introduced origin, while those believed to pre-date European settlement in this region were classed as indigenous origin. Species which do not appear in previous field surveys of Greenwich were considered to be new flora. Finally, taxonomy follows Zinck (1998).

RESULTS

The floral survey conducted in the Central and Schooner Pond Areas of Greenwich, Prince Edward Island National Park revealed 272 vascular species. For an additional 16 genera, some individuals were found which could not be identified to the species level either because the structures required for positive identification were not present or because hybridization makes identification by phenotype questionable. Individuals identified to the level of genus were not included in the determination of abundance indices or habitat statistics as one genus may represent one or several species. These 16 genera are: *Amelanchier*, *Aster*, *Atriplex*, *Bidens*, *Carex*, *Eleocharis*, *Geum*, *Juncus*, *Ribes*, *Rosa*, *Rubus*, *Rumex*, *Salix*, *Scirpus*, and *Viola*.

The Central Area revealed 144 species, while the Schooner Pond Area held 242 species. Within the Schooner Pond Area, the forest was the most diverse habitat with 172 species, followed by wetlands with 124 and sand dune with 89. Because of the small size of the Central Area (24 ha) and the short length of the transects (190 m - 420 m), its habitats were not surveyed individually; results for the Central Area are reported for the entire area rather than by habitat. There was overlap between the flora of the Central and Schooner Pond Areas, with 114 species (42% of the total identified) found on both sites.

Of the 272 species found, 191 (70%) are common on Prince Edward Island, 56 (20%) are uncommon, 10 (4%) are rare, and 13 (5%) are very rare. The remaining two species (1%) - *Myriophyllum spicatum* and *Galium aparine* - were not previously recorded on Prince Edward Island (Figure 5).

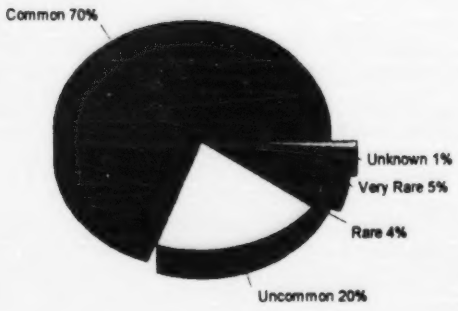


Figure 5: Provincial status of vascular flora identified in the Central and Schooner Pond Areas of Greenwich, Prince Edward Island National Park.

The majority of plants found in the Central and Schooner Pond Areas (211 species, 78%) are indigenous to Prince Edward Island, while 61 (22%) are introduced. However, the proportion of introduced species in the Central Area (28%) was double that of the Schooner Pond Area (14%) (Figure 6).

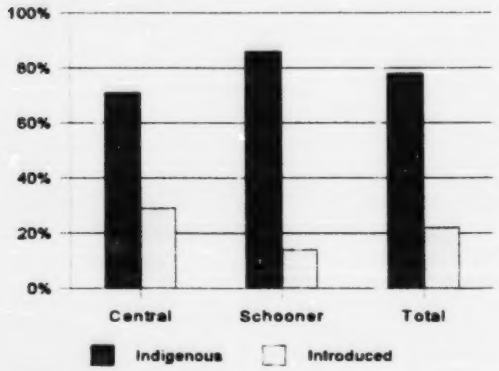


Figure 6: Origin of the vascular flora identified in the Central and Schooner Pond Areas of Greenwich, Prince Edward Island National Park.

Sixty (22%) of the species identified in 1999 were not found during previous floral inventories (Table 1). Of these, 35 (58%) are common to PEI, 13 (22%) are uncommon, two (3%) are rare, nine (15%) are very rare and one (2%) is of unknown status as no published record of its presence on PEI was found. Of the newly identified species, the vast majority (53, 88%) are indigenous to PEI; only seven (12%) are introduced.

Similarly, 54 of the newly-identified species (90%) were found in the Schooner Pond Area only, while three (5%) were found only in the Central Area. The remaining three (5%) were found in both the Schooner Pond and Central Areas (Table 1).

Table 1: Provincial status, origin and location of 60 vascular floral species identified at Greenwich for the first time in 1999. Provincial status and origin are from Erskine (revised, 1985). C=common, found at >12 Erskine stations; U=uncommon, 5-12 stations; R=rare, <5 stations; RR= very rare, listed in Day & Catling (1991). N=Indigenous, I=Introduced. For location, C=Central Area, S=Schooner Pond Area.

Species	Status	Origin	Location
Acer pensylvanicum	C	N	S
Acer spicatum	C	N	C,S
Agrimonia gryposepala	R	N	S
Arisaema triphyllum	C	N	S
Aster puniceus	C	N	S
Carex crinita	C	N	S
Carex debilis	C	N	S
Carex gracillima	RR	N	S
Carex limosa	RR	N	S
Carex retrorsa	U	N	S
Carex rostrata	U	N	S
Carex stipata	C	N	S
Chrysosplenium americanum	C	N	S
Cinna latifolia	C	N	S
Comandra umbellata	RR	N	C
Corallorhiza maculata	U	N	S
Corylus cornuta	C	N	S
Diervilla lonicera	U	N	S
Dulichium arudinaceum	RR	N	S
Elymus repens	C	I	C
Elymus virginicus	RR	N	S
Equisetum fluvitale	C	N	S
Equisetum sylvaticum	C	N	S
Eriocaulon aquaticum	RR	N	S

Eriophorum viridi-carinatum	RR	N	S
Eupatorium maculatum	C	N	S
Fagus grandifolia	C	N	S
Fraxinus americana	R	N	S
Galium aparine	*	I	S
Galium asprellum	C	N	S
Gaultheria hispidula	C	N	S
Gaultheria procumbens	C	N	C,S
Glechoma hederacea	C	I	S
Glyceria grandis	C	N	S
Juglans cinerea	U	N	S
Juncus militaris	RR	N	S
Kalmia polifolia	C	N	S
Lathyrus palustris	C	N	S
Lemna minor	C	N	S
Lobelia dortmanna	RR	N	S
Lonicera canadensis	C	N	S
Matteucia struthiopteris	C	N	S
Mitella nuda	C	N	S
Myriophyllum spicatum	*	I	S
Myosotis laxa	U	N	S
Polygonum lapathifolium	C	I	S
Potamogeton perfoliatum	U	N	S
Potentilla norvegica	C	I	C,S
Prenanthes altissima	U	N	S
Rhinanthus crista-galli	U	N	C
Rhynchospora alba	U	N	S
Ribes triste	U	N	S
Rorippa nasturtium-aquaticum	U	I	S
Rubus allegheniensis	U	N	S
Sparganium chlorocarpum	C	N	S
Sparganium emersum	C	N	S
Taxus canadensis	C	N	S
Trillium cernuum	C	N	S
Ulmus americana	C	N	S
Viburnum opulus	C	N	S

When combined with the 1998 data set for the Western Area, (MacQuarrie *et al*, 1999), 387 species have been identified at Greenwich over two years, 159 of which do not appear on any of the seven known floral inventories of Greenwich undertaken prior to 1998. These seven previous studies had a cumulative total of 304 species, 88 of which were not found at Greenwich in 1998 or 1999 (Table 2, Figure 7). The cumulative total from all known floral inventories of Greenwich is 475 species.

Table 2: Provincial status and origin of 88 vascular floral species previously identified at Greenwich but not found in 1998 or 1999. Status and origin are from Erskine (revised, 1985). C=common, found at >12 Erskine stations; U=uncommon, 5-12 stations; R=rare, <5 stations; RR= very rare, listed in Day & Catling (1991). N=Indigenous, I=Introduced. * = unknown, ** = assumed incorrect.

Species	PEI Stat	Org
Achillea lanulosa	C	N
Agrostis perennans	RR	N
Agrostis rossiae	**	
Amelanchier bartramiana	U	N
Antennaria neodioica	RR	N
Anthemis cotula	R	I
Aronia arbutifoliaXprunifolia	C	N
Aster lanceolatus	RR	N
Atriplex franktonii	RR	N
Atriplex subspicata	*	N
Betula x caerulea var. grandis	R	N
Bidens cernua	C	N
Botrychium matricariifolium	R	N
Brassica rapa	U	I
Cardamine pensylvanica	U	N
Carex arctata	C	N
Carex bebbii	U	N
Carex cumulata	RR	N
Carex deflexa	RR	N
Carex leptonervia	C	N
Carex tonsa	U	N
Chenopodium gigantospermum	RR	N
Corallorhiza trifida	U	N
Corema conradii	RR	N
Coriandrum sativum	*	I
Crataegus flabellata	*	N
Eleocharis halophila	C	N
Eleocharis obtusa	U	N
Eleocharis palustris	U	N
Epilobium adenocaulon	C	N
Epilobium leptophyllum	C	N
Equisetum x litorale	*	*
Erigeron hyssopifolius	**	
Festuca ovina	R	I
Festuca rubra	C	I
Galium boreale	*	N
Galium trifidum	C	N
Glyceria borealis	RR	N
Gnaphalium obtusifolium	RR	N
Heracleum lanatum	U	N
Hieracium canadense	RR	N
Hordeum vulgare	C	I
Hypericum boreale	C	N
Juncus compressus	R	I
Lactuca canadensis	U	N
Lechea intermedia	U	N
Lycopodium sabinaefolium	U	N
Lycopodium sitchense	*	N
Lycopus uniflorus	C	N
Lycopus virginicus	**	

Mimulus ringens	RR	N
Oenothera parviflora	RR	N
Oryzopsis asperifolia	RR	N
Panicum villosissmum	U	N
Pinus strobus	C	N
Poa annua	U	I
Poa compressa	C	I
Poa pratensis	C	I
Potamogeton epihydrus	R	N
Potamogeton spirillus	*	N
Prunus cerasus	R	I
Rorippa sylvestris	R	I
Rosa cinnamomea	U	I
Rumex domesticus	R	I
Rumex mexicanus	R	I
Rumex orbiculatus	C	N
Rumex salicifolius	*	N
Sagittaria cuneata	*	N
Sagina nodosa	RR	N
Salix bebbiana	C	N
Salix discolor	C	N
Salix humulis	U	N
Scirpus acutus	U	N
Scirpus paludosus	R	N
Scirpus rubrotinctus	C	N
Senecio sylvaticus	U	I
Solanum tuberosum	C	I
Solidago altissima	RR	N
Solidago X asperula	R	N
Sonchus asper	R	I
Sonchus oleraceus	U	I
Torreyochloa pallida var. fernaldii	*	N
Triticum aestivum	C	I
Vaccinium corymbosum	*	N
Vaccinium myrtilloides	C	N
Veronica scutellata	RR	N
Vicia angustifolia	C	I
Viola septentrionalis	R	N

CENTRAL AREA

Habitat Description

The Central Area encompassed 15.5 ha of sand dune, 5 ha of primarily coniferous forest, 3 ha of regenerating agricultural land and 0.50 ha of wetland on the north side of the Greenwich peninsula (Figure 2). Microhabitats within this area included aeolian dune, stable grey dune, wet and dry dune slacks, and transition areas where sand dune, forest, wetland and/or old field habitat joined.

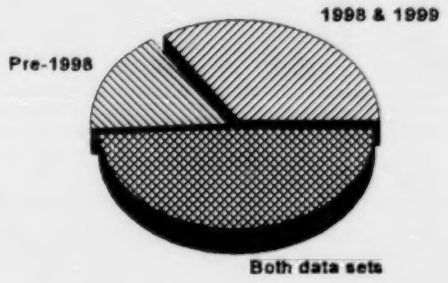


Figure 7: A comparison of the combined 1998/99 species counts with the cumulative total of seven pre-1998 floral inventories. Of a total of 475 species recorded at Greenwich, 228 occur in both data sets, 159 occur only in the 1998/99 data set and 88 occur only in the pre-1998/99 data set.

Index of Abundance

Of the 144 species identified in the Central Area, 25 (17%) are common at the site, being found on seven or more transects. Fifty eight species (41%) were found on four to six transects and so were classed as uncommon, while 36 species (25%) were found on two or three transects and so classed as rare at the site (Table 3). The remaining 25 species (17%) were restricted to a single transect and so considered very rare within the Central Area.

Floral Status and Origin

The provincial status and origin of the Central Area's flora are given in Table 3. Of the 144 species identified here, 113 (78%) are common on PEI, 26 (18%) are uncommon, two (2%) are rare and two (2%) are very rare (Figure 8). The remaining

species, *Hieracium pilloselloides*, is of unknown status in the province.

The majority of species within the Central Area (103, 72%) are indigenous to PEI while the remaining 41 (28%) are introduced (Figure 6).

Table 3: Index of abundance, provincial status and origin of vascular flora identified in the Central Area of Greenwich, Prince Edward Island National Park. For index of abundance, C=common, found on 50-100% of transects, U=uncommon, 25-49%, R=rare, 5-24%, RR=very rare,1-4%. For status, C=found at >12 Erskine stations; U=5-12 stations; R=<5 stations; RR= listed in Day & Catling (1991). N=Indigenous, I=Introduced. Species in ***bold italics*** are new records for Greenwich.

Species	Index of abun.	PEI stat.	Origin
Abies balsamea	C	C	N
Acer rubrum	C	C	N
Acer spicatum	**U**	**C**	**N**
Achillea millefolium	C	C	N
Acorus calamus	RR	U	N
Agropyron repens	U	C	N
Agrostis gigantea	U	C	I
Alisma triviale	RR	U	N
Alnus incana	R	C	N
Ammophila breviligulata	C	C	N
Anaphalis margaritacea	U	C	N
Aralia nudicaulis	C	C	N
Arenaria lateriflora	R	C	N
Aronia melanocarpa	U	U	N
Aronia prunifolia	R	C	N
Artemisia stelleriana	RR	U	I
Aster acuminatus	C	C	N
Aster novi-belgii	C	C	N
Aster umbellatus	R	C	N
Athyrium filix-femina	R	C	N
Betula alleghenienses	R	C	N
Betula papyrifera	C	C	N
Betula populifolia	U	C	N
Cakile edentula	U	C	N
Calystegia sepium	R	C	N
Capsella bursa-pastoris	RR	C	I
Carex paleacea	R	C	N
Chamaedaphne calyculata	RR	C	N
Chenopodium album	R	C	I
Chrysanthemum leucanthemum	U	C	I
Cirsium arvense	RR	C	I
Clintonia borealis	C	C	N
Comandra umbellata	**U**	**RR**	**N**
Comptonia peregrina	U	C	N
Coptis trifolia	U	C	N
Cornus canadensis	C	C	N
Cypripedium acaule	U	C	N
Dennstaedtia punctilobula	R	C	N
Elymus repens	**U**	**C**	**I**
Epigaea repens	U	C	N
Epilobium angustifolium	R	C	N
Epilobium palustre	R	C	N
Equisetum arvense	R	C	N
Erigeron strigosus	RR	C	N
Euthamia graminifolia	RR	C	N
Fragaria virginiana	C	C	N
Galium mollugo	U	C	I
Galium palustre	U	C	N
Galium triflorum	U	C	N
Gaultheria procumbens	**R**	**C**	**N**
Gnaphalium uliginosum	U	C	I
Hieracium aurantiacum	U	C	I
Hieracium floribundum	U	U	I
Hieracium pilosella	U	C	I
Hieracium pilloselloides	U	*	I
Hierochloe odorata	RR	U	N
Honckenya peploides	RR	U	N
Hudsonia tomentosa	U	RR	N
Ilex verticillata	U	C	N
Iris versicolor	U	C	N
Juncus arcticus	U	C	N
Juniperus communis	RR	U	N
Kalmia angustifolia	U	C	N
Larix laricina	R	C	N
Leontodon autumnalis	U	C	I
Ligusticum scothicum	RR	U	N
Linaria vulgaris	U	C	I
Linnaea borealis	C	C	N
Lotus corniculatus	U	R	I
Luzula aciminata	C	U	N
Lycopus americanus	R	C	N
Lysimachia terrestris	R	C	N
Mainathemum canadense	C	C	N
Matricaria matricarioides	R	C	I
Melampyrum lineare	R	U	N
Monotropa uniflora	R	U	N
Myrica gale	U	C	N
Myrica pensylvanica	C	C	N
Nemopanthus mucronata	R	C	N
Oenothera biennis	U	C	N
Onoclea sensibilis	U	C	N
Osmunda cinnamomea	C	C	N
Oxalis stricta	U	C	N
Phegopteris connectillis	U	C	N
Phleum pratense	U	C	I
Picea glauca	C	C	N
Picea rubens X mariana	C	U	N

Plantago lanceolata	R	U	I
Polygonum convolvulus	U	U	I
Polygonum persicaria	RR	U	I
Populus tremuloides	U	C	N
Potentilla anserina	R	C	N
Potentilla norvegica	**R**	**C**	**I**
Potentilla palustris	R	C	N
Potentilla recta	U	U	I
Potentilla tridentata	U	C	N
Prenanthes trifoliolata	R	C	N
Prunus pensylvanica	U	C	N
Prunus virginiana	U	C	N
Pteridium aquilinum	C	C	N
Pyrola secunda	RR	U	N
Ranunculus acris	RR	C	I
Ranunculus repens	R	C	I
Rhianthus crista-galli	**R**	**U**	**N**
Rhododendron canadense	R	C	N
Ribes hirtellum	U	C	N
Rosa virginiana	C	C	N
Rubus idaeus	C	C	I
Rumex acetosella	U	C	I
Rumex crispus	RR	C	I
Sambucus canadensis	U	C	N
Sambucus racemosa	R	C	N
Scirpus americanus	R	C	N
Scirpus cyperinus	R	C	N
Scirpus maritimus	RR	U	N
Senecio jacobaea	RR	C	I
Solidago canadensis	U	C	N
Solidago rugosa	U	C	N
Solidago sempervirens	C	U	N
Sonchus arvensis	U	C	I
Sorbus americana	R	C	N
Sparganium eurycarpum	RR	C	N
Spartina patens	RR	U	N
Spartina pectinata	RR	C	N
Spiraea alba	U	C	N
Stellaria graminea	U	C	I
Streptopus amplexifolius	R	C	N
Taraxacum officinale	U	C	I
Thelypteris palustris	RR	C	N
Tragopogon pratensis	U	U	I
Trientalis borealis	C	C	N
Trifolium arvense	U	U	I
Trifolium campestre	RR	C	I
Trifolium pratense	U	C	I
Trifolium repens	U	C	I
Triglochin maritimum	RR	C	N
Typha latifolia	R	C	N
Vaccinium angustifolium	C	C	N
Vaccinium macrocarpon	R	U	N
Veronica officinalis	U	U	I
Viburnum nudum	C	C	N
Vicia cracca	U	C	I
Vicia sativa	RR	R	I
Viola cucullata	U	C	N

Very rare indigenous species include *Comandra umbellata* and *Hudsonia tomentosa* (Day and Catling, 1991). The two provincially-rare species (Erskine, revised, 1985) are *Lotus corniculatus* and *Vicia sativa*, both of which are introduced to the province and have become more common over the past decade.

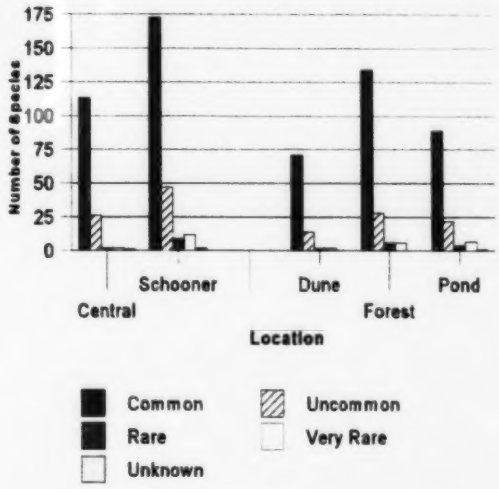


Figure 8: A comparison of the numbers of species of each status in the Central and Schooner Pond Areas, Greenwich, Prince Edward Island National Park. Status by habitat is for the Schooner Pond Area only.

New Flora

All flora identified in the Central Area have at least one published record to document their presence on Prince Edward Island. In the case of *Hieracium pilloselloides*, this record is the 1998 inventory of the Western Area (MacQuarrie *et al*, 1999) and so the provincial distribution of the species remains unknown. Six species identified in the Central Area do not appear in previous

inventories of Greenwich. Of these, four (66%) are common on PEI, one (17%) is uncommon and one (17%) is very rare. Four (66%) are indigenous and two (34%) are introduced (Table 3).

SCHOONER POND AREA

The 177 ha Schooner Pond Area includes sand dune, forest and wetland which were inventoried as discrete habitats. As illustrated in Figure 8, of the 242 species identified in the Schooner Pond Area as a whole, 173 (71%) are common to PEI, 47 (19%) are uncommon, nine (4%) are rare, 11 (5%) are very rare and two (1%) are of unknown status in the province. The majority (208 species, 86%) are indigenous, while 34 (16%) are introduced (Figure 6).

Sand Dune

Habitat Description

The dunes of the Schooner Pond Area are more typical of those found along much of the north shore of Prince Edward Island than are those of the Western Area. The area classed as dune occupies the greatest area of the Schooner Pond region, encompassing approximately 88 ha between Long and Schooner Ponds and the north shore of the peninsula (Figure 2). The microhabitats within this category included aeolian dune, stable grey dune, wet and dry slacks and transition areas where dune joined woodland or wetland.

Index of Abundance

Of the 89 species identified the Schooner Pond Area's sand dune habitat, 14 (16%) are common at the site, being found on nine to 17 transects. Of these, three - *Ammophila breviligulata*, *Myrica pensylvanica* and *Solidago sempervirens* - were found on all transects. Twenty-one species (24%) were classed as uncommon at the site, being found on five to eight transects, while 26 species (29%) were found on two to four transects and so classed as rare. The largest share of species (28, 31%) were restricted to a single transect and so classed as very rare in sand dune habitat (Table 4).

Floral Status and Origin

Seventy one (80%) of the dune flora area common on PEI, 14 (16%) are uncommon, two (2%) are rare and two (2%) are very rare (Table 4, Figure 8). Rare and very rare species include *Carex limosa* and *Typha angustifolia* (Day and Catling, 1991) as well as *Botrychium multifidum* and *Scirpus atrovirens* (Erskine, revised 1985).

Of the sand dune flora, 80 (90%) are indigenous and 9 (10%) are introduced (Table 4, Figure 9).

Table 4: Index of abundance, provincial status and origin of vascular flora identified in sand dune habitat in the Schooner Pond Area of Greenwich, Prince Edward Island National Park. C=Common, U=Uncommon, R=Rare, RR=Very Rare, N=Indigenous, I=Introduced. For index of abundance, C= found on 50-100% of transects, U=found on 25-49%, R=found on 5-24%, RR=found on 1-4%. For PEI status (from Erskine, revised 1985), C=found at more than 12 stations, U=5-12 stations, R=fewer than 5 stations, RR=listed in Day & Catling, 1991. *=unknown status. Species in ***bold italics*** are new records for Greenwich.

Species	Ind of abun	PEI stat	Org
Acer rubrum	U	C	N
Acorus calamus	R	U	N
Agrostis gigantea	R	C	I
Alnus incana	R	C	N
Ammophila breviligulata	C	C	N
Anaphalis margaritacea	R	C	N
Aralia hispida	R	C	N
Aralia nudicaulis	R	C	N
Arenaria latifolia	C	C	N

Aronia prunifolia	U	C	N
Artemesia stelleriana	U	U	I
Aster umbellatus	RR	C	N
Betula papyrifera	R	C	N
Betula populifolia	R	C	N
Botrychium multifidum	RR	R	N
Cakile edentula	C	C	N
Calamagrostis canadensis	C	C	N
Calystegia sepium	U	C	N
Carex canescens	RR	C	N
Carex limosa	**RR**	**RR**	**N**
Carex silicea	C	C	N
Cicuta bulbifera	U	C	N
Cornus sericea	RR	C	N
Deschampsia flexuosa	U	C	N
Dryopteris cristata	U	C	N
Empetrum atropurpureum	R	U	N
Epilobium angustifolium	R	C	N
Epilobium palustre	R	C	N
Eupatorium maculatum	**RR**	**C**	**N**
Euthamia graminifolia	RR	C	N
Fragaria virginiana	U	C	N
Galium palustre	U	C	N
Hieracium pilosella	C	C	I
Honckenya peploides	U	U	N
Ilex verticillata	R	C	N
Impatiens capensis	R	C	N
Iris versicolor	U	C	N
Juncus arcticus	C	C	N
Juniperus communis	RR	U	N
Lactuca biennis	RR	C	N
Larix laricina	RR	C	N
Lathyrus maritimus	U	C	N
Ligusticum scothicum	RR	U	N
Lycopus americanus	U	C	N
Lysimachia terrestris	U	C	N
Maianthemum canadense	R	C	N
Myrica gale	C	C	N
Myrica pensylvanica	C	C	N
Oenothera biennis	R	C	N
Onoclea sensibilis	R	C	N
Picea glauca	C	C	N
Plantathera lacera	RR	C	N
Polygonum convolvulus	R	U	I
Populus tremuloides	R	C	N
Potamogeton natans	RR	U	N
Potentilla palustris	U	C	N
Potentilla tridentata	R	C	N
Prunus pensylvanica	RR	C	N
Rhododendron canadense	RR	C	N
Ribes hirtellum	U	C	N
Ribes triste	RR	U	N
Rosa rugosa	RR	U	I
Rosa virginiana	C	C	N
Rubus idaeus	C	C	I
Rubus pubescens	RR	C	N
Rumex acetosella	RR	C	I
Rumex crispus	RR	C	I
Sambucus canadensis	RR	C	N
Sambucus racemosa	RR	C	N
Scirpus americanus	RR	C	N
Scirpus atrovirens	RR	R	N
Scirpus cyperinus	RR	C	N
Scutellaria galericulata	R	C	N
Sium suave	R	C	N
Solidago rugosa	R	C	N
Solidago sempervirens	C	U	N
Spartina pectinata	U	C	N
Spiraea alba	C	C	N
Taraxacum officinale	RR	C	I
Thalictrum pubescens	R	C	N
Toxicodendron radicans	RR	U	N
Triadenum fraseri	R	C	N
Trientalis borealis	U	C	N
Typha angustifolia	RR	RR	N
Typha latifolia	R	C	N
Vaccinium angustifolium	U	C	N
Vaccinium macrocarpon	U	U	N
Vaccinium oxycoccus	R	U	N
Viburnum nudum	U	C	N

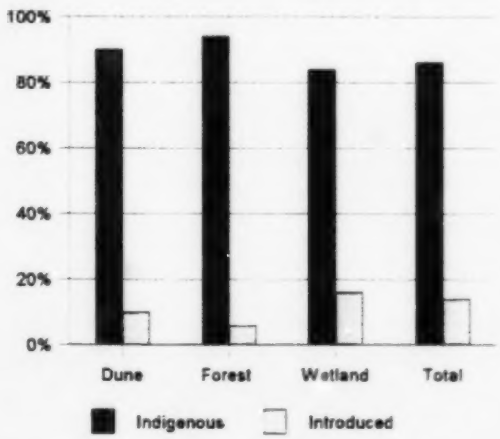


Figure 9: The proportion of indigenous to introduced species in the Schooner Pond Area, Greenwich, Prince Edward Island National Park by habitat type and for the area as a whole.

New Flora

All flora identified in the dunes of the Schooner Pond Area have at least one

published record to document their presence on Prince Edward Island. Two species - *Carex limosa* and *Eupotorium maculatum* - do not appear on previous Greenwich floral surveys. In addition to the species listed in Table 4, individuals representing seven genera were found that could not be identified to the species level because the features required for identification were not present or because hybridization within the genus makes positive identification based on phenotype alone questionable. Individuals of the following genera were present in Schooner Pond's sand dune habitat: *Aster*, *Amelanchier*, *Eleocharis*, *Rubus*, *Rumex*, *Salix*, and *Scirpus*.

Forest

Habitat Description

Forested land encompasses approximately 46 ha of the Schooner Pond Area. This ranges from retired agricultural lands and cut-over areas of primarily coniferous species, to mixed coniferous-deciduous woodland to rich wet areas of primarily hardwood species. As illustrated in Figure 2, the forest occupies land between and south of Long and Schooner Ponds, as well as an area east of Schooner Pond.

Index of Abundance

Of 172 species identified in this habitat, 32 (18%) are common at the site, occurring on more than 12 of the forest transects. Twenty-four species (14%) were found on seven to 12 transects and so were classed as uncommon to the site, while 67 species (39%) were found on two to six transects and classed as rare. The remaining 49 species (29%) were restricted to a single transect and so were classed as very rare within the forest (Table 5).

Table 5: Index of abundance, provincial status and origin of vascular flora identified in forest habitat in the Schooner Pond Area of Greenwich, Prince Edward Island National Park. C=Common, U=Uncommon, R=Rare, RR=Very Rare, N=Indigenous, I=Introduced. For index of abundance, C= found on 50-100% of transects, U=found on 25-49%, R=found on 5-24%, RR=found on 1-4%. For PEI status (from Erskine, revised 1985), C=found at more than 12 stations, U=5-12 stations, R=fewer than 5 stations, RR=listed in Day & Catling, 1991. *=unknown status. Species in ***bold italics*** are new records for Greenwich.

Species	Ind of abun	PEI status	Origin
Abies balsamea	C	C	N
Acer pensylvanicum	**R**	**C**	**N**
Acer rubrum	C	C	N
Acer spicatum	RR	C	N
Acorus calamus	RR	U	N
Actaea rubra	R	C	N
Agrimonia gryposepala	**RR**	**R**	**N**
Agrostis gigantea	R	C	I
Alnus incana	C	C	N
Ammophila breviligulata	R	C	N
Aralia nudicaulis	C	C	N
Arisaema triphyllum	**R**	**C**	**N**
Aronia prunifolia	R	C	N
Aster acuminatus	C	C	N
Aster lateriflorus	RR	C	N
Aster novi-belgii	RR	C	N
Aster puniceus	**RR**	**C**	**N**
Aster umbellatus	R	C	N
Athyrium filix-femina	U	C	N
Betula papyrifera	C	C	N
Betula populifolia	U	C	N
Bidens frondosa	R	C	N
Calamagrostis canadensis	U	C	N
Calamagrostis stricta	RR	RR	N
Caltha palustris	R	C	N
Carex crinita	**RR**	**C**	**N**
Carex debilis	**RR**	**C**	**N**
Carex gracillima	**RR**	**RR**	**N**
Carex intumescens	U	U	N
Carex limosa	**RR**	**RR**	**N**
Carex retrosa	**RR**	**U**	**N**
Carex rostrata	**RR**	**U**	**N**
Carex stipata	RR	C	N
Chamaedaphne calyculata	R	C	N
Chrysanthemum leucanthemum	RR	C	I

Chrysosplenum americanum	RR	C	N
Cicuta bulbifera	RR	C	N
Circaea alpina	R	C	N
Cirsium arvense	RR	C	I
Clintonia borealis	C	C	N
Comptonia peregrina	R	C	N
Coptis trifolia	C	C	N
Corallorhiza maculata	**RR**	**U**	**N**
Cornus canadensis	C	C	N
Cornus sericea	R	C	N
Corylus cornuta	**R**	**C**	**N**
Cypripedium acaule	U	C	N
Dennstaedtia punctilobula	RR	C	N
Deschampsia flexuosa	C	C	N
Diervilla lonicera	**R**	**U**	**N**
Diphasiastrum digitatum	RR	C	N
Drosera rotundifolia	R	C	N
Dryopteris cristata	C	C	N
Dryopteris carthusiana	R	C	N
Epigaea repens	C	C	N
Epilobium angustifolium	U	C	N
Epilobium ciliatum	RR	C	N
Epilobium palustre	RR	C	N
Equisetum arvense	R	C	N
Equisetum sylvaticum	**R**	**C**	**N**
Eupatorium maculatum	**R**	**C**	**N**
Euthamia graminifolia	RR	C	N
Fagus grandifolia	**R**	**C**	**N**
Fragaria virginiana	C	C	N
Fraxinus americana	**R**	**R**	**N**
Galium aparine	**R**	**C**	**I**
Galium asprellum	**RR**	**C**	**N**
Galium palustre	R	C	N
Galium triflorum	R	C	N
Gaultheria hispidula	**R**	**C**	**N**
Gaultheria procumbens	**U**	**C**	**N**
Gaylussacia baccata	RR	C	N
Geum laciniatum	RR	RR	N
Gymnocarpum dryopteris	R	C	N
Hieracium aurantiacum	RR	C	I
Hieracium floribundum	R	U	I
Hieracium pilosella	R	C	I
Hippurus vulgaris	RR	U	N
Ilex verticillata	C	C	N
Impatiens capensis	U	C	N
Iris versicolor	U	C	N
Juglans cinerea	**RR**	**R**	**N**
Juncus arcticus	R	C	N
Juncus effusus	RR	C	CN
Kalmia angustifolia	C	C	N
Kalmia polifolia	**R**	**C**	**N**
Larix laricina	R	C	N

Ledum groenlandicum	RR	C	N
Lemna minor	**R**	**C**	**N**
Linnaea borealis	C	C	N
Lonicera canadensis	**U**	**C**	**N**
Luzula acuminata	C	U	N
Lycopodium annotinum	U	C	N
Lycopodium obscurum	R	C	N
Lycopus americanus	U	C	N
Lysimachia terrestris	R	C	N
Maianthemum canadensis	C	C	N
Matteuccia struthiopteris	**R**	**C**	**N**
Melampyrum lineare	C	U	N
Menyanthes trifoliata	R	U	N
Mentha arvensis	RR	C	N
Mitella nuda	**R**	**C**	**N**
Moneses uniflora	RR	U	N
Monotropa uniflora	U	U	N
Myosotis laxa	**RR**	**U**	**N**
Myrica gale	U	C	N
Myrica pensylvamica	U	C	N
Nemopanthus mucronata	C	C	N
Onoclea sensibilis	U	C	N
Osmunda cinnamomea	C	C	N
Osmunda claytoniana	U	C	N
Oxalis stricta	RR	C	N
Phegopteris connectilis	RR	C	N
Picea glauca	C	C	N
Picea rubens X mariana	C	U	N
Polygonum cilinode	R	R	N
Polygonum hydropiper	RR	C	N
Polygonum sagittatum	R	C	N
Populus grandidentata	R	C	N
Populus tremuloides	C	C	N
Potentilla palustris	R	C	N
Prenanthes altissima	**RR**	**U**	**N**
Prenanthes trifoliolata	U	C	N
Prunus pensylvanica	U	C	N
Prunus virginiana	R	C	N
Pteridium aquilinum	C	C	N
Pyrola elliptica	RR	C	N
Pyrola rotundifolia	R	U	N
Pyrola secunda	C	U	N
Quercus rubra	RR	U	N
Ranunculus repens	R	C	I
Rhododendron canadense	R	C	N
Ribes glandulosum	R	U	N
Ribes hirtellum	R	C	N
Ribes lacustre	R	C	N
Rosa virginiana	C	C	N
Rubus allegheniensis	**U**	**U**	**N**
Rubus hispidus	R	U	N
Rubus idaeus	R	C	I

Rubus pubescens	C	C	N
Sagittaria latifolia	R	U	N
Sambucus canadensis	R	C	N
Sambucus racemosa	U	C	N
Scirpus cyperinus	R	C	N
Scirpus validus	RR	C	N
Scutellaria galericulata	R	C	N
Scutellaria lateriflora	R	C	N
Sium suave	R	C	N
Solanum dulcamara	R	R	I
Solidago bicolor	RR	U	N
Solidago rugosa	R	C	N
Solidago sempervirens	RR	U	N
Sorbus americana	C	C	N
Sparganium eurycarpum	RR	C	N
Spartina pectinata	RR	C	N
Spiraea alba	U	C	N
Streptopus amplexifolius	RR	C	N
Streptopus roseus	R	C	N
Taxus canadensis	**U**	**C**	**N**
Thalictrum pubescens	U	C	N
Thelypteris noveboracensis	R	U	N
Toxicodendron radicans	R	U	N
Triadenum virginicum	R	C	N
Trientalis borealis	C	C	N
Trillium cernuum	**R**	**C**	**N**
Typha angustifolia	RR	RR	N
Typha latifolia	R	C	N
Ulmus americana	**RR**	**C**	**N**
Vaccinium angustifolium	C	C	N
Vaccinium macrocarpon	R	U	N
Veronica officinalis	R	U	I
Viburnum opulus	**RR**	**C**	**N**
Viburnum nudum	C	C	N

In addition to the 172 species listed in Table 5, individuals of 13 genera were found that could not be identified to the species level because the structures required for identification were absent, or because hybridization makes positive identification by phenotype questionable. The following genera were present in the forest habitat: *Amelanchier*, *Aster*, *Avens*, *Carex*, *Eleocharis*, *Geum*, *Juncus*, *Ribes*, *Rosa*, *Rumex*, *Salix* and *Viola*.

Floral Status and Origin

The provincial status and origin of the forest flora are given in Table 5. One hundred and thirty four (78%) of the species identified are common on PEI, 29 (17%) are uncommon, five (3%) are rare and four (2%) are very rare (Figure 8). All forest species have at least one published record of their occurrence on PEI.

Rare and very rare species include *Calamagrostis stricta*, *Carex gracillima*, *Carex limosa* and *Typha angustifolia* (Day and Catling, 1991), as well as *Agrimonia gryposepala*, *Fraxinus americana*, *Juglans cinerea*, *Polygonum cilinode*, and *Solanum dulcamara* (Erskine, revised 1999).

Of the forest flora, 162 (94%) are indigenous while 10 (6%) are introduced (Figure 9).

New Flora

Thirty-five species identified in the forest of the Schooner Pond Area do not appear on previous floral surveys of Greenwich (Table 5). Of these, 23 (66%) are common in the province, seven (20%) are uncommon, three (8%) are rare and two (6%) are very rare. Thirty four (97%) are indigenous to Prince Edward Island while only one (3%) is introduced.

Wetland

Habitat Description

The wetland habitat of the Schooner Pond Area includes 43 ha, being approximately three-quarters of the 31 ha Long Pond and all of the 20 ha Schooner Pond. The streams flowing into and out of Schooner Pond are

also included in the wetland habitat, giving a total of four wetland locations: Long Pond, Schooner Pond, North Stream and South Stream (Figure 2).

Wetland Diversity

Long Pond had the highest diversity as measured by species count, with a total of 60 vascular species identified. Thirty eight species were identified within Schooner Pond, with 47 and 46 species being found in the North and South Streams respectively (Figure 10).

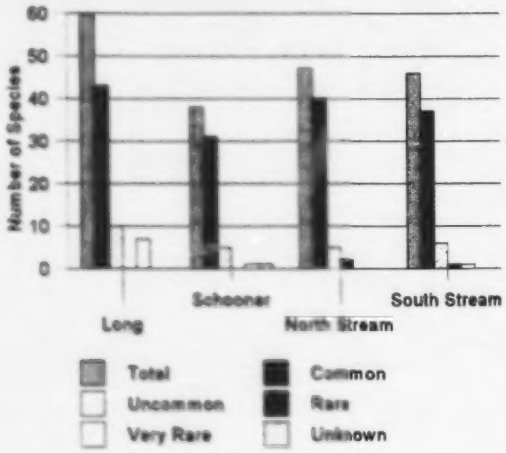


Figure 10: A comparison of the numbers of species of each status by wetland location in the Schooner Pond Area, Greenwich, Prince Edward Island National Park.

Index of Abundance

Of the 124 species found in the Schooner Pond Area's wetland habitats, 18 (15%) are common, being found in at least three of the four wetland locations (Table 6). Twenty-five (20%) were found in two wetland locations and so were classed as uncommon while the remaining 81 species (65%) were found in only one wetland location and so were classed as rare in the Schooner Pond Area. Long Pond had the highest number of species classed as rare within the wetland habitats, with 31 species (24% of the wetland total) found only in this pond. By comparison, only 6 species (5% of the wetland total) were found only in Schooner Pond.

Floral Status and Origin

The provincial status and origin of the wetland flora are given in Table 6. Eighty-nine species (72%) of the species identified are common on PEI, 22 (18%) are uncommon, four (3%) are rare, and eight (6%) are very rare. The one remaining species - *Myriophyllum spicatum* - is of unknown status as no published record of its presence in the province has been found. Of the wetland flora, 104 (84%) are indigenous and 20 (16%) are introduced (Table 6). Long Pond was the only wetland area with no introduced species, followed by Schooner Pond with six, the North Stream with seven and the South Stream with 11 (Figure 11).

Table 6: Index of abundance, provincial status and origin of vascular flora identified in two pond and two stream habitats in the Schooner Pond Area of Greenwich, Prince Edward Island National Park. C=Common, U=Uncommon, R=Rare, RR=Very Rare, N=Indigenous, I=Introduced. For index of abundance, C= found in 3-4 habitats, U=found in 2, R=found in 1. For PEI status (from Erskine, revised 1985), C=found at more than 12 stations, U=5-12 stations, R=fewer than 5 stations, RR=listed in Day & Catling, 1991. *=unknown status. Species in ***bold italics*** are new records for Greenwich.

Species	Ind of abun	PEI stat	Orig
Achillea millefolium	R	C	N
Acorus americana	U	U	N
Alnus incana	C	C	N
Ammophila breviligulata	R	C	N

Aronia melanocarpa	R	U	N
Arenaria lateriflora	R	C	N
Aster novi-belgii	R	C	N
Artemesia stelleriana	R	U	I
Athyrium filix-femina	R	C	N
Betula papyrifera	R	C	N
Betula populifolia	R	C	N
Cakile edentula	R	C	N
Calamagrostis canadensis	C	C	N
Calystegia sepium	C	C	N
Carex crinita	**R**	**C**	**N**
Carex intumescens	R	U	N
Carex limosa	**R**	**RR**	**N**
Carex paleacea	R	C	N
Carex pseudo-cyperus	U	C	N
Carex retrorsa	**R**	**U**	**N**
Carex silicea	R	C	N
Carex stipata	**U**	**C**	**N**
Chamaedaphne calyculata	R	C	N
Cicuta bulbifera	U	C	N
Cirsium arvense	R	C	I
Cornus sericea	R	C	N
Drosera rotundifolia	R	C	N
Dulichium arudinaceum	**R**	**RR**	**N**
Elymus virginicus	**R**	**RR**	**N**
Epilobium ciliatum	U	C	N
Epilobium palustre	R	C	N
Equisetum fluviatile	**R**	**C**	**N**
Eriocaulon aquaticum	**R**	**RR**	**N**
Eriophorum viridi-carinatum	**RR**	**RR**	**N**
Eupatorium maculatum	**U**	**C**	**N**
Euthamia graminifolia	R	C	N
Fragaria virginiana	R	C	N
Galium palustre	U	C	N
Glaux maritima	R	C	N
Glyceria grandis	**R**	**C**	**N**
Gnaphalium uliginosum	R	C	I
Hieracium pilosella	R	C	I
Hippuris vulgaris	R	U	N
Ilex verticillata	U	C	N
Impatiens capensis	C	C	N
Iris versicolor	U	C	N
Juncus arcticus	R	C	N
Juncus effusus	U	C	N
Juncus militaris	**R**	**RR**	**N**
Juncus pelocarpus	R	U	N
Kalmia polifolia	R	C	N
Lathyrus maritimus	R	C	N
Lathyrus palustris	**R**	**C**	**N**
Ledum groenlandicum	R	C	N
Lemna minor	**C**	**C**	**N**
Leontodon autumnalis	R	C	I
Lobelia dortmanna	**R**	**RR**	**N**
Lycopus americanus	C	C	N
Lysimachia terrestris	C	C	N
Matteucia struthiopteris	**R**	**C**	**N**
Melampyrum lineare	R	U	N
Mentha arvensis	U	C	N
Menyanthes trifoliata	R	U	N
Myosotis laxa	**R**	**U**	**N**
Myrica gale	C	C	N
Myrica pensylvanica	U	C	N
Myriophyllum spicatum	**R**	*	**I**
Nemopanthus mucronata	R	C	N
Nuphar variegata	R	U	N
Oenothera biennis	U	C	N
Onoclea sensibilis	C	C	N
Osmunda cinnamomea	R	C	N
Phleum pratense	R	C	I
Picea glauca	U	C	N
Picea mariana	R	C	N
Plantago major	R	C	I
Plantago maritima	R	R	N
Polygonum cilinode	R	R	N
Polygonum hydropiper	R	C	N
Polygonum lapathifolium	**R**	**C**	**I**
Polygonum persicaria	R	U	I
Polygonum sagittatum	U	C	N
Potamogeton natans	U	U	N
Potamogeton perfoliatum	**R**	**U**	**N**
Potentilla anserina	R	C	N
Potentilla norvegica	**R**	**C**	**I**
Potentilla palustris	C	C	N
Pteridium aquilinum	R	C	N
Rhododendron canadense	R	C	N
Rhyncospora alba	**R**	**U**	**N**
Ribes hirtellum	R	C	N
Rorippa nasturtium-aquaticum	**R**	**U**	**I**
Rosa rugosa	R	U	I
Rosa virginiana	R	C	N
Rubus hispidus	R	U	N
Rubus idaeus	U	C	I
Rumex acetosella	R	C	I
Rumex maritimus	R	RR	N
Sagittaria latifolia	C	U	N

Scirpus americanus	C	C	N
Scirpus artovirens	R	R	N
Scirpus validus	C	C	N
Scutellaria galericulata	C	C	N
Sium suave	C	C	N
Solanum dulcamara	U	R	I
Solidago rugosa	R	C	N
Solidago sempervirens	R	U	N
Sonchus arvensis	U	C	I
Sparganium angustifolium	R	U	N
Sparganium chlorocarpum	**R**	**C**	**N**
Sparganium emersum	**U**	**C**	**N**
Sparganium eurycarpum	U	C	N
Spartina pectinata	C	C	N
Spiraea alba	C	C	N
Thalictrum pubescens	U	C	N
Triadenum virginicum	U	C	N
Trientalis borealis	R	C	N
Trifolium campestre	R	C	I
Triglochin maritimum	R	C	N
Typha latifolia	C	C	N
Vaccinium angustifolium	R	C	N
Vaccinium macrocarpon	U	U	N
Viburnum nudum	R	C	N
Vicia cracca	U	C	I

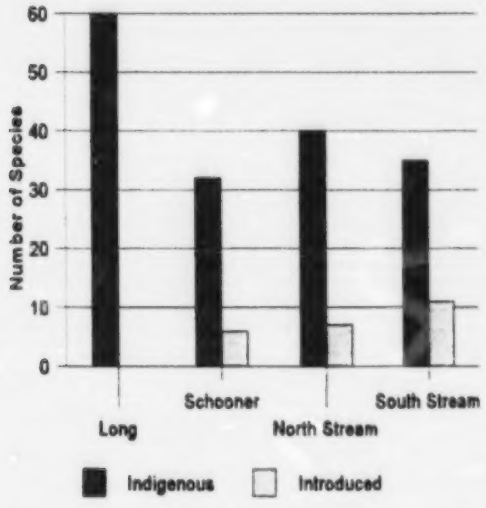


Figure 11: A comparison of the numbers of indigenous and introduced species in the four wetland habitats of the Schooner Pond Area, Greenwich, Prince Edward Island National Park.

New Flora

One wetland species was found for which no published Island record exists. The introduced *Myriophyllum spicatum* was present in Schooner Pond. Twenty-five of the wetland species identified do not appear on previous floral inventories of Greenwich (Table 6). Of these newly identified flora, 12 (50%) are common on PEI, five (21%) are uncommon, none are rare, seven (25%) are very rare and one (4%) is of unknown status. Twenty-two (88%) are indigenous to PEI and three (12%) are introduced.

In addition to the species listed in Table 6, individuals of nine genera were found which could not be positively identified to the species level because the structures required for identification were absent or because hybridization makes identification by phenotype questionable. The following genera were present in the wetland habitats: *Amelanchier*, *Aster*, *Bidens*, *Eleocharis*, *Ribes*, *Rosa*, *Rubus*, *Rumex*, and *Viola*.

DISCUSSION

The combined results of the 1998 and 1999 floral inventories at Greenwich suggest that this area has seen some change since previous research in the 1970s and 1980s. Of the cumulative total of 475 species identified at Greenwich, roughly half (228 species, 48%) were identified in both pre- and post-1998 work. Of the remaining 247 species, 64% were found only in the 1998/99 inventories while 36% were identified only in pre-1998 research (Figure 7).

NEW FLORA

New Island Record

Of the 60 species identified at Greenwich for the first time in 1999, only one has not been previously recorded on Prince Edward Island: *Myriophyllum spicatum* (Eurasian Water Milfoil) was found in Schooner Pond.

This is a highly invasive species that is native to Europe, Asia, and Northern Africa. Although it is unclear exactly when or how it was introduced to North America, it was first collected in the southwestern United States in the mid-1940s. From here, it spread to the eastern US via anglers, boaters and waterfowl (Couch and Nelson, 1985).

This plant was first identified in Canada in the 1960s and a decade later was considered a problem weed in both Ontario and Quebec (Aitken, Newroth and Wile, 1979). It has also been recorded in British Columbia nad has become an exterme problem in the Okanagan Lakes of that province (S. Blaney, pers. comm). The Greenwich record, when confirmed, will be the first for Atlantic Canada.

Myriophyllum spicatum roots in the pond substrate and grows toward the surface, where it branches to form very dense mats. It has been shown to displace native aquatic species (Miller and Trout, 1985; Hanna, 1984; Aiken *et al*, 1979), interfere with fish spawning (Newroth, 1985), impede recreational watercraft and present a public safety hazard to swimmers who can become entangled in the vegetation.

Although *M. spicatum* has been shown to be susceptible to 2,4-D (Aitken *et al*, 1979), chemical control of the plant has obvious disadvantages including impacts on non-target species and water contamination. Its ability to spread vegetatively makes physical control of this plant of questionable use. Any mechanical means of harvesting or uprooting the plant will invariably result in fragments which can accelerate its spread. In some US reservoirs, water level manipulation has shown some success (Bates, Burns and Webb, 1985), however this is clearly not an option for a natural water body such as Schooner Pond.

More recent research into control of *M. spicatum* focuses on biological controls ranging from diseases to fish such as the herbivorous grass carp (*Ctenopharyngodon idella*). Introduction of new exotic species to control existing exotic species is not a management technique authors of this paper recommend for National Parks.

Quarantine programs have been used in British Columbia in an effort to prevent boaters from spreading the plant to other water bodies, however this has been shown to only delay distribution (Newroth, 1985). This may be a useful management technique for Schooner Pond, however it should be recognized that wildlife such as waterfowl may also be responsible for the spread of this species. Regardless of management techniques used, spread of *M. spicatum* on PEI may well be inevitable.

New Greenwich Records

In addition to the one new Island record, 59 species were identified at Greenwich for the first time in 1999 (Table 1). Of these, only three were restricted to the Central Area with an additional three found in both the

Central and Schooner Pond Areas. The remaining 53 newly identified species were found in the Schooner Pond Area only. The high number of newly identified species (22% of the total) was attributed to the apparent absence of effort in the Central and Schooner Pond Areas during previous inventories, rather than to succession or other changes in floral composition.

A number of provincially or regionally rare species not previously known from Greenwich were found. *Comandra umbellata* is a small, inconspicuous perennial considered rare on Prince Edward Island and in Nova Scotia (Day and Catling, 1991; Pronych and Wilson, 1993). As with other members of the family *Santalaceae*, *C. umbellata* is a hemiparasite, receiving part of its energy by attaching to host plants via underground haustoria. Host genera include *Aster*, *Antennaria*, *Solidago*, *Rosa*, *Rubus*, *Fragaria*, *Vaccinium*, *Acer*, *Betula*, *Populus* and *Carex* (Hedgecock, 1915), all of which are present in the Central Area at Greenwich. In the Maritimes, the species is associated with sandy areas, dunes and exposed headlands (Zinck, 1998; Hinds, 1986; Erskine 1985), although it is associated with grazed pastures elsewhere in North America.

In the Central Area, *C. umbellata* was found growing along the side of the main access road, in the interface of the old field and dune area, and along a vehicle track behind the primary dunes (Figure 3). Authors of this study note that this ruderal habitat is fully in keeping with that in which this species has been found elsewhere on the Island and in the Maritimes. While this habitat is disturbed, care must be taken to avoid assuming that such areas cannot harbour rare or uncommon species. In a previous study in the Western Area at Greenwich, 43% of newly identified old field species and 60% of newly identified shoreline species were considered uncommon, rare or very rare on Prince Edward Island (MacQuarrie *et al*, 1999). In that report, researchers cautioned Parks Canada about making the assumption that no rare species will occur in a disturbed area. This caution is re-iterated here.

The use of disturbed habitats by locally or regionally rare species cannot be stressed enough in PEI National Park. While such habitats may be disturbed by natural causes such as flood or fire, they may also be artificially disturbed, as is seen in roadsides and abandoned fields. Rare or uncommon ruderal species occur in both naturally and artificially disturbed habitats. Parks Canada's failure to recognize this led to creation of a service road through a population of *C. umbellata* during the 1999 field season.

Although not placed on the species list for the Central Area, the provincially rare *Liparis loeselii* may be present here. During an autumn screening for the beach access trail, researchers of this study found a plant closely resembling this species in a small boggy area. Because of the late date of the discovery, flowers were not present and frost had seriously damaged the leaves. A corm characteristic of the genus was found. The presence of this species should be confirmed in the coming field season.

Several of the newly-identified rare species were found in Long Pond. *Carex limosa*, *Dulichium arudinaceum*, *Eriocaulon aquaticum*, *Eriophorum viridi-carinatum*, *Juncus militaris*, and *Lobelia dortmanna* all

occur in or around Long Pond and all are absent from the Prince Edward Island National Park Plant List (1981/82). These species are known from only one or two other areas on Prince Edward Island, giving added importance to the protection of this wetland.

SPECIES ABSENT IN 1999

This study found 60 species not previously known from Greenwich, and identified a further 17 species that appeared on pre-1998 inventories but that were not found in 1998. However, 88 species remain undiscovered at Greenwich in 1998 or 1999 although they appear on previous inventories (Table 2). Of these, 14 (16%) are species for which no published Island record has been found. Several of these (eg. *Agrostis rossiae*, *Lycopus virginicus*) are not known from this part of North America and are likely misidentifications. Many of these have been traced to the 1971 Checksheet for the International Biological Program. A researcher involved with that program has cautioned that this work was done very early in the surveyors' botanical careers and misidentifications are possible (D. Griffin, pers. comm.). Other species recorded in previous surveys but absent from the 1998 and 1999 work may also be misidentifications.

In 1998 and 1999 combined, 14 genera were found for which at least one individual could not be positively identified to the species level. These 14 genera represent 30 species (34% of those) which appear on pre-1998 surveys but which were not found in 1998 or 1999. Additional research into *Amelanchier*, *Aster*, *Atriplex*, *Bidens*, *Carex*, *Crataegus*, *Eleocharis*, *Juncus*, *Potamogeton*, *Rosa*, *Rumex*, *Salix*, *Scirpus*, and *Viola* at Greenwich may reduce the number of species recorded at Greenwich prior to 1998 but absent from the 1998 and 1999 research.

These are notoriously difficult genera, many of which cannot be identified by casual observation in the field. For example, *Atriplex* spp. may require genetic analysis for positive identification, *Eleocharis* spp. require fully mature achenes and *Salix* spp. readily hybridize. *Amelanchier* spp. are known to be parthenocarpic, and there is disagreement within the scientific community about which are true species. Because previous surveys do not include information on the techniques used, the accuracy of identification of these technically difficult genera cannot be adequately assessed.

Six species (7%) are cultivated plants that were remnants of agricultural practices during the 1988 inventory and have since disappeared from the site. One would generally not expect species such as *Brassica rapa*, *Hordeum vulgare*, *Solanum tuberosum* and *Triticum aestivum* to persist once agricultural land has been retired.

The remaining 38 (43% of) species not found in either 1998 or 1999, may still be present within Greenwich. Although this research had a very high sample effort (nearing 10%), species present in isolated areas and/or very low numbers could be missed. For example, *Quercus rubra* appears on pre-1998 inventories of Greenwich but was not found in 1998. Supplementary work related to trail creation in 1999 uncovered a single specimen of *Q. rubra* in the Western Area. Species such as this that can be present in very low numbers and are not likely to be misidentified, are

almost certainly present on the peninsula. An obvious example from Table 2 is *Pinus strobus*.

It is also noted that the boundaries of previous inventories are not well defined. It is possible that one or more of the seven floral inventories undertaken prior to 1998 included areas that are not within those lands that now comprise Greenwich, Prince Edward Island National Park. Finally, the small size of the area surveyed may be a factor in changes in species composition. Colonizations and extinctions are more likely to alter species composition in a small area than a regional one.

OVERALL FLORAL STATUS, ORIGIN AND DIVERSITY

Despite the number of new species found and those apparently absent, the total floral status and origin have remained relatively constant since the pre-1998 inventories. However, there appears to be a difference among the three Parks Canada parcels at Greenwich, with the Schooner Pond Area having more very rare species and fewer introduced species than the other properties (Table 7).

The lower number of introduced species is an indication that the Schooner Pond Area has not been as recently disturbed as the other two areas. The introduced flora present in the Western and Central Areas but absent at Schooner Pond include those commonly associated with old field or roadside habitats: *Chenopodium album*, *Galium mollugo*, *Linaria vulgaris*, *Lotus corniculatus* and *Senecio jacobaea* among others.

Table 7: A comparison of the provincial floral status and origin in the Western, Central and Schooner Pond Areas of Greenwich, PEI National Park. C=common, found at >12 stations by Erskine (revised, 1985), U=uncommon, 5-12 stations, R=rare, <5 stations, RR= very rare, listed in Day & Catling, 1991., *=unknown status, N=indigenous, I=introduced. Top line is the number in each category, bottom is the percentage of the total.

	C	U	R	RR	*	N	I	Tot
Western Area[1]	192	62	22	7	10	209	84	293
	65	21	8	2	3	71	29	100
Central Area	113	26	2	2	1	103	41	144
	78	18	2	2	1	72	28	100
Schooner Pond Area	173	47	9	11	2	208	34	242
	71	19	4	5	1	86	14	100

[1]From MacQuarrie *et al*, 1999.

The Schooner Pond Area is the only one of the three Greenwich parcels to lack early old field habitat, giving an obvious explanation for the absence of these species. The forest at Schooner Pond showed markedly fewer introduced species than those in the Western Area (Table 8). With a very few exceptions (eg. *Betula pendula*), the introduced species in the forest of the Western Area are associated with old field habitats. Their presence can be attributed to the presence of old field adjacent to the Western Area's forest or to species that have persisted from previous cycles of land clearing. The lack of such habitat adjacent to the forest of the Schooner Pond Area explains the absence of these species there.

All introduced species in the ponds of the Schooner Pond Area were in Schooner Pond or its inflow or outlet streams; Long Pond was found to have only indigenous species. The non-native floral component within the Schooner Pond system is likely the result of a combination of two factors: the area has a long history of use by anglers and

recreational boaters, and the pond is fed by Schooner Creek which flows through agricultural and residential areas before reaching Schooner Pond. This creek is the location of the highest number of introduced species in the Schooner Pond system.

Table 8: A comparison of the numbers and percentages of introduced species by habitat in the Western and Schooner Pond Areas at Greenwich, PEI National Park. Top line is number of introduced species, bottom line is the percentage of the total species found in that habitat.

	Dune	Forest	Pond	Field
Western Area[1]	27	18	5	57
%	17	38	7	54
Schooner Pond Area	9	11	20	N/A
%	10	6	16	N/A

[1] From MacQuarrie *et al*, 1999.

It would be incorrect to say that the Schooner Pond Area has never been disturbed by human activity. The 1935 airphotos of the Greenwich peninsula show that much of the forest south and east of Schooner Pond was cleared at that time. However, other areas within this easternmost section of PEI National Park are wet and/or not easily accessible and do not appear to have been extensively disturbed in comparison to the other two areas at Greenwich.

Forest

Consistent with results of the 1998 inventory of the Western Area (MacQuarrie *et al*, 1999), greatest species diversity was found in the forest habitat. This is again attributed to a combination of vertical stratification and edge effect.

Much of the coniferous forest in the western portion of the Central Area is dominated by *Picea rubens* (reported as X *mariana*[1]) rather than the more typical *Picea glauca*. The flat topography suggests that this area is of old field origin, and the 1935 aerial photos confirm that the land was cleared at that time. It is unusual to find *P. rubens* in an old field situation on PEI, and the damp condition of the ground suggests that this species may indeed be the hybrid (*P. mariana* is associated with wetter sites).

The forest in the Schooner Pond Area includes a number of noteworthy species. In an area north of the traditional access road into the pond *Fraxinus americana*, *Ulmus americana*, *Viburnum opulus* and *Juglans cinerea* were found (Figure 4). The first three are generally considered to be Western PEI species, rarely being found east of Charlottetown (Erskine, revised 1985), while the latter is rarely found anywhere in the province. With the exception of *U. americana* (which had been reported in the area anecdotally), the presence of these species was unexpected within Greenwich. Meacham's 1880 Atlas of Prince Edward Island shows a 4 ha homestead in this area, and local residents can still recall when this area was occupied. It is probable that these species were planted by former residents and thus indicate the location of the homestead and its associated grounds.

There is much debate locally about the origin of *Juglans cinerea*. The species is native to

[1] Recent research by the PEI Forestry Division and the Canadian Forest Service examined specimens identified as *P. rubens* from across the province. All individuals carried genetic markers of *P.mariana*, indicating a hybrid (W. Glen, pers. comm). The results of this work suggest that *P. rubens* cannot be identified solely by phenotype on PEI, thus authors of this study report only the hybrid.

the St. John River Valley of New Brunswick (Hinds, 1986), but apparently absent from Nova Scotia (Zinck, 1998). The 1881 census of Canada recorded 4,935 cubic feet of "soft walnut" from Prince County and 66 cubic feet from Queens County. William Glen of the PEI Forestry Division has suggested this could be *J. cinerea* (pers. comm.). Others within the PEI Forestry Division have noted that species were being moved from one area to another much earlier than this (D. McAskill, pers. comm) and the presence of *J. cinerea* on PEI at an early date cannot be assumed to indicate indigenous status. The Canadian Forest Service has no evidence to suggest that *J. cinerea* is indigenous to PEI, but nor does it have evidence to suggest it is introduced (J. Loo, pers. comm). In the absence of definitive information about the origin of *J. cinerea*, authors of this study have applied the precautionary principle and classed it as indigenous.

It is noted that butternut canker, a disease that has killed up to 80% of the trees in some States, is spreading across North America but has not yet been isolated on PEI (W. MacKinnon, pers. comm). Dutch elm disease is prevalent in Western PEI and is spreading east. At this time, inoculation of trees against these diseases is not possible, and available treatment is limited to removal of infected limbs or individual trees to reduce the rate of spread. Trees within the National Park should be monitored for these diseases, and plans prepared for removal and proper disposal of infected material.

Other provincially rare indigenous species within the forest at Schooner Pond include *Calamagrostis stricta*, *Carex gracillima*, *Carex limosa*, *Eriophorum viridi-carinatum*, *Polygonum cilinode* and *Typha angustifolia* (Erksine, revised 1985; Day and Catling, 1991).

Ponds

The four ponds of Greenwich, PEI National Park have been surveyed over two years: Bowley and Bog Ponds in 1998 and Long and Schooner Ponds in 1999 (Figure 1). Authors of this study have observed marked differences in vascular plant species composition among these ponds. The presence/absence data collected from these wetlands were analyzed using the Baroni-Urbani and Buser similarity coefficient, based on a two-by-two contingency table. This analysis provides an assessment of how botanically similar the ponds are using the following equation:

$$S_B = \frac{\sqrt{ad} + a}{a + b + c + \sqrt{ad}}$$

in which S_B is the Baroni-Urbani and Buser similarity coefficient, a is the number of species present in both ponds, b is the number of species present in pond #1 only, c is the number of species present in pond #2 only, and d is the number of species absent from both ponds. This is among the least-used of the many binary similarity measures because it considers species absent from the samples. There is much disagreement in the literature about whether this is a biologically meaningful number. It is clearly meaningful to the case at hand, as the flora of all four ponds is known and the absence of a species from one or more ponds is relevant to the comparison.

In its simplest form, the coefficient values range from 0 (totally dis-similar) to 1

(identical), as presented in Table 8. It must be noted that differences in sample size can have dramatic effects on the expected maximum value (Krebs, 1989). As the methodology used for the pond inventories resulted in comparable sample sizes for each of the four ponds, the effect of size on the Baroni-Urbani and Buser coefficient should be negligible.

Table 9: Comparison of Bowley, Bog, Long and Schooner Ponds at Greenwich using the Baroni-Urbani and Buser similarity coefficient. Values range from 0.0 (totally dissimilar ponds) to 1.0 (identical ponds).

	Bowley	Bog	Long	Schooner
Bowley	1.0	**0.71**	0.50	0.42
Bog	**0.71**	1.0	0.52	
Long	0.50	0.52	1.0	0.51
Schooner	0.42		0.51	1.0

Bog and Bowley Ponds exhibit the strongest similarity with a coefficient of 0.71. This is consistent with observations from the 1998 field season, and explains why the botanical diversity among the ponds was not fully realized during that research. The most botanically dissimilar ponds are Schooner and Bog, with a coefficient of 0.36. Schooner Pond is the only one of the four that is clearly stream-fed with an outflow to the Gulf of St. Lawrence. As such, it is the only Greenwich pond with tidal influences and could reasonably be expected to be different from the other three. All other ponds exhibit similarity coefficients in the range of 0.42 to 0.52, demonstrating that the marked difference in species composition observed in the field does indeed exist.

This is especially interesting in light of MacArthur's (1976) suggestion that the two westernmost ponds were part of the same river system as recently as 250 years ago, and that Schooner and Long Pond appear to be part of the same body of water on Meacham's 1880 and Cummins 1928 atlases.

In considering a binary similarity coefficient such as Baroni-Urbani and Buser, it must be noted that each species is considered to be equal to every other species; a rare indigenous species carries the same weight as a common introduced one. Of the ten very rare species found in the Greenwich ponds, six occur only in Long Pond. It is also noteworthy that no introduced species were found in Long Pond during the 1999 inventory. Prince Edward Island is a heavily disturbed and fragmented landscape. The PEI Forestry Division estimates that 69% of the province was deforested by 1900 (PEI Forestry Division, 1997), and this history of extensive land use shows up in our flora. It is estimated that a third of the vascular plant species recorded on PEI are introduced to this province (Erskine, revised 1985). Authors of this study have over a decade of experience in floral inventories on PEI and have completed studies in virtually every habitat available in the province. Long Pond is the only area in which these researchers have found only indigenous species. This, combined with the rarities in Long Pond should make this wetland a high priority for conservation. Specifically, the potential for spread of *Myriophyllum spicatum* to Long Pond, and any possible introduction of physical, chemical or biological contaminants from developments in the Central Area into Long Pond should be a concern for Parks Canada managers.

It is also noted that many of the rarities of Long Pond have been found in only one or two other ponds in the province. It is not known whether these species are extant at those locations, and none of the ponds other than those at Greenwich has protected status under Provincial or Federation legislation. O'Keefe's Lake in Kings County has been recorded as a location of *Dulichium arundinaceum*, *Eriocaulon aquaticum*, *Juncus militaris*, and *Lobelia dortmanna*. In 1999, this pond was limed in an effort to bring the pH down to a level better suited to the introduced rainbow trout (*Salmo gairdneri*), at the request of local anglers (B. Smith, pers. comm). This is not the first time O'Keefe's Lake has been limed since Erskine found the rarities there in the 1950s. Although *J. militaris* appears on a 1984 inventory (Westaway, Gillis, MacInryre and Moore, 1984), and both it and *L. dortmanna* were recorded during a 1987 survey (Kelly and MacDonald, 1987), it is not known if these or the other two rarities persist at this site.

Many of Prince Edward Island's ponds are also threatened with residential development. A subdivision approved for the shores of O'Keefe's Lake over a decade ago appears to be set to begin development: transmission lines were erected in the summer of 1999. Glenfinnan Lake in Queens County - the site of some of the rarities found at Greenwich in 1998 and 1999 (eg. *Elatine minima*, *Eriocaulon aquaticum*, *Lobelia dortmanna*) - also has subdivisions approved for approximately 50% of the pond's perimeter, and it is expected that these will be developed as cottages or year-round residences.

The fact the ponds outside Greenwich, PEI National Park are under such stress places added importance on the protection of Bowley, Bog, Long and Schooner Ponds and the rare flora each contains.

Dune

Lowest species diversity was found in the sand dune habitat, which is inconsistent with results from the Western Area but not unexpected. The dunes of the Central and Schooner Pond Areas do not exhibit the parabolic form, Gegenwalle, and highly diverse slacks of those in the Western Area. This reduced diversity of habitat translates into reduced species diversity, although it is noted that these dunes remain sensitive landscape features. A slightly higher proportion of the flora of the Schooner Pond dunes are indigenous, compared to the dunes of the Western Area (90% indigenous at Schooner Pond, 83% in the Western Area). This is almost certainly a result of the dune/old field interface present in the Western Area but not at Schooner Pond.

Regardless of the numbers of species present in the dunes, human disturbance has the potential to seriously degrade this habitat and threaten ecological integrity. Parks Canada is reminded that as few as ten pedestrian passes over a sand dune can leave a lasting path of dead *Ammophila breviligulata* and lead to human-caused blowouts (MacQuarrie, 1973). Blowouts contribute to a deterioration of ecological integrity, as well as decreasing visual aesthetics and the related appeal to visitors.

CONCLUSIONS AND RECOMMENDATIONS

The authors caution that these recommendations relate only to the flora of Greenwich, Prince Edward Island National Park, and are made without benefit of detailed information on other physical and biological factors. As such, they are not intended to stand alone, but rather to be combined with a suite of recommendations that should be generated by additional research into other aspects of Greenwich, PEI National Park.

ZONING

The Greenwich Interim Management Guidelines (Parks Canada, 1998) outline zoning plans for Greenwich. Areas recommended by the guidelines for Zone I (Special Preservation Areas) in the Schooner Pond Area include the sand dunes (except those in the westernmost region of this area, where a private right-of-way exists) and wetlands around the ponds, but not the ponds themselves. There is no Zone I land in the Central Area.

The guidelines do not prescribe any areas as Zone II (Wilderness Areas). Zone III (Natural Environment Areas) is applied to Long Pond, Schooner Pond, the forest of the Schooner Pond Area, the sand dunes of the westernmost region of the Schooner Pond area, and the sand dunes of the Central Area. Zone IV (Outdoor Recreation Areas) is to include a small portion of the Schooner Pond Area adjacent to the Cable Head Road and the woodlands and retired agricultural land in the southern region of the Central Area. The guidelines do not recommend any areas for Zone V (Park Services Area) designation.

Zone I

The results of the 1999 floral survey support the Zone I recommendations of the Interim Management Guidelines. It is therefore recommended that Zone I designation be applied to those areas indicated as such in the Greenwich Interim Management Guidelines. However, there are areas of Zone III and Zone IV that merit further consideration and possible re-classification as Zone I; these are outlined in the following sections.

Zone III

The results of the 1999 floral survey suggest that there are several areas designated Zone III which merit further consideration.

Long and Schooner Ponds are habitat for several very rare species, including those known from only one or two other locations in the province. Additionally, Long Pond was found to have only indigenous species, a fact authors of this study consider significant. Presently, Long Pond is visited only by the landowner of the adjacent private property; Schooner Pond sees low levels of use from recreational anglers.

The infrastructure that would be required to accommodate the activities suggested for these areas by the Interim Management Guidelines (eg. picnic tables, kitchen facilities, access trails, docking facilities, *etc.*) has the potential to stress these ponds through dramatically increased visitor use and the introduction of new exotic species. As the reasons for the botanical diversity among the ponds at Greenwich is not known, effects of increased recreational use of these areas on the floral communities and

rare species cannot be adequately assessed.

It is recommended that Parks Canada make every effort to extinguish the private right-of-way over Long Pond and to acquire the pond's westernmost portion or, at a minimum, enter into a legally-binding conservation agreement with the private landowner. Because of the uniqueness of this area and the habitat it provides to rare floral species, the right-of-way has the potential to seriously impair the ecological integrity of the pond if it were to be developed. Long Pond should be included within the Zone I area at Greenwich, but authors of this study acknowledge that the right-of-way makes this difficult to implement. At a minimum, Long Pond should be designated as an environmentally significant site, and elevated to Zone I status as soon as the right-of-way is extinguished. It is recommended that Schooner Pond be designated as an environmentally sensitive site, with consideration given to possible future Zone I designation.

The forest of the Schooner Pond Area has a low proportion of introduced species - less than half that observed in the Western Area, and lower than authors of this study had anticipated. Additionally, provincially rare species are scattered throughout the area. As with the ponds, the infrastructure required to accommodate the activities suggested for these areas by the Interim Management Guidelines has the potential to threaten rarities and increase the proportion of introduced species present. Of the three areas studied at Greenwich in 1998 and 1999, the Schooner Pond area most closely meets the definition of ecological integrity used by Parks Canada[2]. For this reason, it is recommended that the forest of the Schooner Pond Area not be developed as described in the Interim Management Guidelines, and that consideration be given to possible future Zone I status.

Zone IV

Results of the 1999 floral survey suggest that there are areas recommended for Zone IV status that merit further consideration. The locations of the regionally rare *Comandra umbellata* in the Central Area are within the Zone IV. Given that intensive facility development has already occurred here, changes in zoning are not recommended. Authors of this study strongly caution Parks Canada against any future application of Zone IV designation, with subsequent creation of infrastructure, in areas for which the biological data are not known.

Consistent with comments about the Zone III designation in the Schooner Pond Area, the Zone IV designation here should not be used for intensive facility development. It should therefore be assigned the same Zone as the adjacent parkland.

OPPORTUNITIES FOR PROTECTION AND PRESENTATION

The Greenwich Interim Management Guidelines outline development proposals for the Central and Schooner Pond Areas of Greenwich. Proposals for the Central Area

[2] Ecological integrity is the condition of an ecosystem where the structure and function of the ecosystem are unimpared by stresses induced by human activity and the ecosystem's biological diversity and supporting processes are likely to persist (Parks Canada, 1997).

were implemented in the summer of 1999 and discussion of opportunities for that area relates to existing intensive visitor facilities. Proposals for the Schooner Pond Area remain conceptual as described in the Interim Management Guidelines.

Central Area

A parking area for 90 cars and ten recreational vehicles has been established in the Central Area, connected by a service road and pedestrian path to the visitor facilities. These facilities include a raised deck on which structures housing food services, washrooms, showers, and change facilities are located, plus the associated sewage system. Before this area is opened to the public in the summer of 2000, these facilities will also include photovoltaic/wind power and a combination of gravel path and boardwalk to provide beach access. Future plans include an amphitheatre. Existing Park infrastructure was created on retired agricultural land.

As noted previously in this report, there are areas of concern within the Central Area. The regionally rare *Comandra umbellata* was found along either side of the access road into this area, as well as in the northern portion of the old field, where this habitat meets sand dune. From a conservation point of view, these areas should not be further disturbed by Park development. It is expected that *C. umbellata* will be out-competed if the old field is allowed to undergo natural succession. As the plant is present in the dunes west of this field, the species is expected to persist within the Central Area. Active management to perpetuate *C. umbellata* in the old field in later successional stages than it would naturally occur is deemed by the authors to be not necessary for conservation of the plant within Greenwich as a whole and is thus not recommended. That said, efforts to ensure protection of this species in the sand dune habitat and in the old field habitat (for as long as it naturally occurs there) should be implemented. At a minimum, these efforts should prevent visitors from accessing *C. umbellata* habitat, and ensure that any future development in the Central Area does not impact the species.

The presence of this species in ruderal habitats in the Central Area could serve as a valuable case study for interpretive purposes. The role of ruderal habitats in conserving native flora and the conservation significance of rare flora within our National Parks (and Greenwich specifically) are but two of many topics that could be introduced to visitors via interpretive staff and materials.

This study has identified *Picea rubens* X *mariana* in the western part of the Central Area. It is recommended that this be confirmed via genetic analysis as either a hybrid or pure *P. rubens*. If it is the latter, efforts should be made to conserve this species within the Central Area and consideration should be given to allowing the PEI Forestry Division or other researchers to collect seed for propagation and conservation of the pure species province-wide.

Careful consideration should be given by Parks Canada to a vegetation management plan for the Central Area. The authors strongly recommend that this begin immediately with development of a long term vision for what Parks Canada wishes this site to look like decades into the future. For

example, site meetings between the researchers of this study and the designer of the facilities in the Central Area suggest that the view from the parking area to the visitor facilities, and from there to the water, was an important factor in the location and orientation of the development. Obviously, management decisions relating to the retired agricultural land will have a major effect on how this area appears in the future. Given the intensive visitor use planned for this area, authors of this study feel it is unlikely that the site of visitor facilities can be managed as a natural area and so have no recommendations in this regard, other than to suggest that every attempt be made to use only indigenous species in any restoration to be done, including but not limited to establishing vegetative cover around parking lots and buildings.

Sand dunes are sensitive landscape features and heavy visitation has the potential to stress such areas to the point where their ecological integrity is seriously compromised. Given the high level of visitation probable for the Central Area, there is no question in the authors' minds that the Central Area will see significant stress in the coming years. Given the close proximity of the Central Area to the Western and Schooner Pond Areas, problems here have the potential to extend to and negatively effect the rest of the Greenwich adjunct. Parks Canada can manage this stress through visitor management regimes which should include provisions to prevent visitors from straying beyond designated areas (eg. railed boardwalks, symbolic fencing, signage) coupled with limits on the numbers of visitors permitted to use the area and strict enforcement of all conservation measures. Ongoing monitoring will be critical to ensure visitor use of the Central Area is balanced with protection.

Schooner Pond Area

The Interim Management Guidelines for Greenwich propose that a ten vehicle parking lot, washrooms, interpretive panels, trail to Schooner Pond, kitchen shelter, picnic area and floating dock be created in the Schooner Pond Area. The document suggests that recreational fishing will be permitted and - pending an assessment of resources and visitor demand - camping facilities could be provided.

As noted previously in this study, of the three parcels at Greenwich, the Schooner Pond Area seems to be the least disturbed by human activity. This, combined with the rare flora scattered throughout the site lead the authors to strongly recommend that these facilities not be created in the Schooner Pond Area. Given the interpretive and recreational opportunities provided by the Western and Central Areas, development of Schooner Pond would be unnecessary, excessive and in conflict with Parks Canada's stated objective to offer only basic visitor facilities and services (Interim Management Guidelines, p9).

That said, there does not appear to be any compelling reason to prohibit the traditional use of Schooner Pond by local anglers. Those who use this area estimate that fewer than 100 individuals would visit this site in an average year, and because of the poor condition of the access road, boats are no longer used. Anglers walk in the existing disturbed access road and/or a narrow footpath south of this road to fish in the eastern areas of the pond. The rare plant

species are primarily found in the western part of the pond. It is therefore recommended that traditional angling be allowed to continue at current levels unless data on the fish fauna suggest otherwise. Creation of trails or structures to assist anglers or to facilitate visitation to this area are not recommended, nor are any efforts to actively promote Schooner Pond to anglers.

Should Parks Canada choose to ignore this recommendation and allow boating in Schooner Pond, the authors caution that the presence of *Myriophyllum spicatum* in the pond should be verified and plans developed to prevent its spread to other wetlands by boaters.

In terms of vegetation management for the Schooner Pond Area, it is recommended that individuals of *Ulmus americana* and *Juglans cinerea* be monitored for the presence of Dutch elm disease and butternut canker respectively. Should individuals of either species become infected, a treatment plan should be implemented in an effort to control the spread of these diseases. It is recommended that this plan include removal and proper disposal of the diseased portions of trees partially infected. Fully infected trees should be removed from the area and destroyed in accordance with accepted sanitation practices for handling material infected with these diseases.

MONITORING ECOLOGICAL INTEGRITY

MacQuarrie, Schaefer and Schoenrank (1999) discuss the design and implementation of a system for monitoring ecological integrity within the Western Area of Greenwich, PEI National Park. The monitoring objectives and approach to selecting indicator species outlined there should also be applied to the Central and Schooner Pond Areas. The following suggested indicator species were identified using the same criteria as outlined in the previous study.

Ecological Indicator Species

The following suggested indicator species represent preliminary findings and are not intended to stand alone. They should be included with a suite of other indicator species including small mammals, birds, amphibians, reptiles, invertebrates and non-vascular flora. Additionally, vascular species other than those suggested here may prove to be valuable indicators of ecological change and stress, and additional research may result in the identification of other appropriate floral indicators. Specifically, the authors recommend that Parks Canada identify which of the species known to occur at Greenwich may be suitable indicators of climate change, acidification, and other forms of large scale ecological change.

Introduced Species

The presence of introduced species in an ecosystem may be indicative of a larger problem or the species themselves may pose threat to the system. Their presence is often an indication of ecosystem distress (Keddy, Lee and Wisheu, 1993). Several species in this category warrant monitoring at Greenwich.

The presence of *Myriophyllum spicatum* in Schooner Pond should be confirmed and its spread monitored. Every precaution should be taken to prevent spread of this species from Schooner Pond to other ponds either

within Greenwich or elsewhere on Prince Edward Island. Should a viable means of eradicating this species from Greenwich be found, it should be implemented. *Lythrum salicaria*, although not found at Greenwich, is present in the nearby community of St. Peter's Bay (T. Duffy, pers. comm). This species may out-compete indigenous vegetation and reduce use of wetland habitats by some fauna. Wetlands at Greenwich should be monitored to facilitate early detection and active management.

The boundaries around Parks Canada land at Greenwich have been cleared in accordance with standard Parks practices. In the short term, these lines may serve as conduits through which new introduced species may arrive in the National Park or existing introduced species may spread. These areas should be monitored for introduced species, especially those such as *Achillea millefolium*, *Cirsium arvense*, *Hieracium* spp., *Linaria vulgaris* and other particularly aggressive, prolific and persistent weedy species. Such species may begin to turn up in areas along the boundary lines in which they were previously unrecorded. If this is observed in the absence of changes in land use outside the Park, consideration should be given to amending the practice of boundary cutting.

Areas around visitor facilities, trails and beach accesses within Greenwich should be monitored for any change in the range of the aforementioned non-native species, or the arrival of previously unrecorded exotics. The change in proportion of introduced species may be an indication of increasing or decreasing ecological integrity.

As the only area within the Greenwich adjunct where no introduced species were found, Long Pond may make an interesting longer term indicator. The appearance of exotic species here may be indicative of stress on the system, or at least increased disturbance either within or adjacent to the Park.

Indigenous Species

Most rare species are vulnerable to human induced changes in the environment, and their presence may indicate an ecosystem with integrity. Systems with integrity may also lack rare species, and thus their absence does not automatically indicate distress (Keddy *et al*, 1993). Provincially or regionally rare species found at a single site within the Park make reasonable indicators; if they reduce in abundance or range (or disappear entirely) exclusive of natural successional processes, the area may be stressed.

Such species at Greenwich include *Comandra umbellata* and *Hudsonia tomentosa* in the more stable dune of the Central Area; *Dulichium arundinaceum*, *Eriocaulon aquaticum*, *Eriophorum viridi-carinatum*, *Juncus militaris*, and *Lobelia dortmanna* in Long Pond; *Rumex maritimus* in Schooner Pond; and *Agrimonia gryposepala* in the Schooner forest.

Ammophila breviligulata is an obvious indicator species, being both a keystone species in the sand dune areas and a plant with a known sensitivity to human caused disturbance. Changes in the distribution or abundance of *A. breviligulata* in primary or secondary dune areas is often an indication of stress on a broad sector of dune species.

It is strongly recommended that Parks Canada select indicator species as part of the Ecosystem Conservation Plan for Greenwich (in prep) and specify the standard against which monitoring data can be measured. Each indicator should be assigned a desirable and tolerable level so that should an indicator move outside this acceptable range, it is clearly evident and appropriate action can be taken.

Permanent monitoring plots should be established within each habitat at Greenwich to show specific trends typical of stress ecosystems. This would include loss of indigenous species diversity, changes in community diversity, and habitat fragmentation. An index or indices such as the number of negative trends from one reporting period to the next should be developed.

Ecological Integrity Statement

As recommended previously (MacQuarrie *et al*, 1999), Parks Canada should develop an Ecological Integrity Statement for Greenwich. This should include an ecological description of Greenwich which considers the existing baseline data on the condition of the ecological resources prior to official opening of the adjunct in 2000. This statement should also include a list of stressors affecting the ecological integrity of the Park which may include, among other things: Park operations, visitation and infrastructure, presence of introduced species, shoreline pollution, regional development and associated impacts, long range transport of air pollutants, and legal and illegal wildlife harvest. Based on identified stressors, Park Ecosystem Integrity Objectives should be developed and any planned management activities should be designed to meet these objectives.

Because of the small size and fragmented nature of Greenwich, PEI National Park, management of visitor activities will comprise a major component of maintenance of ecological integrity. Greenwich exists within a heavily modified landscape and activities beyond Park boundaries will affect the Park. Co-operation with adjacent landowners in management and monitoring is essential. This is especially evident in the case of Long Pond, whose westernmost section remains privately owned.

ADDITIONAL RECOMMENDATIONS

This study examined only the vascular flora of the Central and Schooner Pond Areas of Greenwich. To achieve an accurate assessment of ecological integrity, additional research is needed. For example, virtually nothing is known of the non-vascular flora of Greenwich. As non-vascular species, especially lichens, have been shown to be key indicators for factors ranging from air quality to habitat loss, an inventory of lichens and bryophytes should be undertaken as soon as funding allows. Similarly, little data exist on the avifauna, mammals, herptiles or invertebrates of Greenwich; significant gaps in the scientific knowledge of this area remain.

Researchers of this study suggest that one vascular species not previously known from PEI may be present within Greenwich. This information is insufficient to add this taxon to the list of PEI flora. It is therefore recommended that Parks Canada collect additional specimens of the species and have identification verified. Once verified, properly mounted and labeled herbarium

specimens should be prepared as voucher material and made available to Maritime herbaria (such as the E.C. Smith Herbarium at Acadia University) as well as the Department of Agriculture Experimental Farm (DAO) in Ottawa.

The 1998 and 1999 research suggests that despite their geographical proximity and similar histories, the four ponds at Greenwich are botanically distinct. Additional research into selected physical and chemical parameters should be undertaken in an effort to determine the reason(s) for this. Such information will assist in future management, protection and interpretation of these important wetlands.

A comparison of future research with the results of this study should provide insight into species changes and ecosystem stress. It is recommended that the next floral inventory of the Central and Schooner Pond Areas should follow the methodology of this research and be undertaken not later than 2004. As clearly outlined by Schaefer (1999), such surveys should be accompanied by population research and monitoring, including but not limited to the establishment of permanent sample plots and photographic records of rare species.

The Government of Prince Edward Island passed endangered species legislation in 1998. As a result, Island Nature Trust has prepared a provincial species-at-risk list for Island wildlife, including vascular flora. This list is currently undergoing review by regional experts and is expected to be finalized by March 31, 2000. It is recommended that Parks Canada cross-reference the species list from the 1999 inventory with the provincial at-risk list to identify provincially endangered, threatened and vulnerable flora. Conservation measures for any at-risk species within Greenwich should be identified and implemented.

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APPENDIX 1

Common names for Greenwich flora and a comparison of MacQuarrie, Schaefer & Schoenrank's 1998 (Western Area) and 1999 (Central and Schooner Pond Areas) floral inventories of the Greenwich peninsula with the results of the seven known previous floral inventories of this area.

Scientific Name	Common Name	Status[1]	Previous Records[2]	Western	Central	Schooner
Abies balsamea	Balsam Fir	C,N	3,6,7	X	X	X
Acer pensylvancum	Striped Maple	C,N				X
Acer rubrum	Red Maple	C,N	3,4,5,6,7	X	X	X
Acer saccharum	Sugar Maple	C,N	6	X		
Acer spicatum	Mountain Maple	U,N			X	X
Achillea lanulosa	Yarrow	C,N	3,5,6	X		
Achillea millefolium	Yarrow	C,I	7	X	X	X
Acorus americanus syn: Acorus calamus[3]	Sweet Flag	U,N	2,3,4,5,7	X		X
Actaea rubra	Red Baneberry	C,N		X		X
Agrimonia gryposepala	Agrimony	R,N				X
Agropyron repens	Quack Grass, Couch	C,N	3	X	X	
Agrostis capillaris syn: A tenuis	Brown Top	C,I	3,7	X		
Agrostis gigantea syn: A. alba, A. palustris, A. stolonifera	Red Top	C,I	3,7	X	X	X
Agrostis hyemalis syn: A. scabra	Tickle Grass	C,N	7	X		

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[1] C=common; found across PEI in 13 or more stations by Erskine.
U=uncommon; limited to one region of PEI or found in five to 12 stations by Erskine.
R=rare; found in four or fewer stations by Erskine.
RR=very rare; listed by Day & Catling.
N=native; believed to pre-date European settlement.
I=introduced; known to have arrived after European settlement.
, = Species not found in regional reference texts.
*,N or *,I = Species not listed for PEI but native (N) or introduced (I) to the region.

[2] 1. 1970(a) - Diane Griffin and Anna Cairns; survey date August 4, 1970, survey area unknown. Given that all of the species are also in (2) below, this may be part of that survey.
2. 1970(b) - Diane Griffin and Anna Cairns; survey date August 21, 1970, survey area unknown.
3. 1971 - Checksheet for the International Biological Programme completed by Dr. Ian MacQuarrie. Checksheet completed September 7, 1971.
4. 1975 - Guignion, Margo. *Biological Resource Inventory* prepared for the Planning and Special Studies Division, PEI Department of Tourism, Parks and Conservation.
5. 1984 - Survey of five communities on PIDs 180315, 525360, 180125, 180109, 401372, 180158, 180083, 593301, 484519, 180059, 180075, 180034, 180026 and 180018 by Campbell, Westaway, MacIntrye and Gillis; survey date August 20, 1984.
6. 1987 - Survey of PIDs 180018 and 180026 by Diane Griffin; survey date October 7, 1987.
7. 1988 - Survey of dunes, slacks, woodlands, and ponds by Hal Hinds, Diane Griffin, Doug Kelly and Marianne Fitzpatrick; survey date August 1, 1988.

[3] *Acorus calamus* is considered to be a sterile, European plant (Zinck, 1998) but its name is often used synonomously with *Acorus americanus*.

Scientific Name	Common Name	Status	Previous Records	Western	Central	Schooner
Agrostis perennans	Bent Grass	RR,N	3,4			
Agrostis rossae	Bent Grass	*,*[4]	1,2			
Alisma triviale	Water Plantain	U,N	3		X	
Alnus incana	Speckled Alder	C,N	2,3,4	X	X	X
syn: Alnus rugos						
Amelanchier bartramiana	Mountain Serviceberry	U,N	3			
Amelanchier laevis	Smooth Serviceberry	U,N		X		
Amelanchier lucida	Shadbush, Wild Pear	RR,N	3	X		
syn: A. canadensis						
Amelanchier spicata	Serviceberry	R,N		X		
Ammophila breviligulata	Marram Grass	C,N	1,2,3,4,5,6,7	X	X	X
Anaphalis margaritacea	Pearly Everlasting	C,N	2,3,4,5,6,7	X	X	X
Antennaria neglecta	Pussytoes	C,N	7	X		
Antennaria neodioica	Pussytoes	RR,N	7			
Anthemis cotula	Stinking Mayweed	R,I	3			
Aralia hispida	Bristly Sarsaparilla	C,N	3,7	X		X
Aralia nudicaulis	Sarsaparilla	C,N	3,5,6,7	X	X	X
Arenaria lateriflora	Sandwort	C,N	3,7	X	X	X
Arenaria serpyllifolia	Sandwort	R,I		X		
Arisaema tryphyllum	Jack-in-the-Pulpit	C,N				X
Aronia arbutifolia X prunifolia - Chokeberry		C,N	2,3,4			
Aronia melanocarpa	Black Chokeberry	U,N	5,7	X	X	X
Aronia prunifolia	Red Chokeberry	C,N		X	X	X
Artemesia stelleriana	Beach Wormwood	U,I	2,3,4,7	X	X	X
Aster acuminatus	Wood Aster	C,N	2,3,4,6,7	X	X	X
Aster lanceolatus	Aster	RR,N	7			
Aster lateriflorus	Aster	C,N		X		X
Aster novi-belgii	New York Aster	C,N	2,3,4,5,7	X	X	X
Aster puniceus	Rough Aster	C,N				X
Aster umbellatus	Tall White Aster	C,N	2,3,4,7	X	X	X
Athyrum filix-femina	Lady Fern	C,N		X	X	X
Atriplex franktonii	Orach	RR,N	7			
syn:Atriplex hastata						
Atriplex littoralis	Orach	R,I		X		
Atriplex subspicata	Orach	*[5],N	7			
Avena sativa	Oats	C(cult.), U(wild),I - 3		X		
Barbarea vulgaris	Yellow Rocket	U,I		X		
Betula allegheniensis	Yellow Birch	C,N		X	X	
Betula caerulea-grandis	Blue Birch	R,I	3			
Betula papyrifera	White Birch	C,N	2,3,4,5,6,7	X	X	X
Betula pendula	European Birch	*[6],I		X		

[4] Specific name not found in *Flore Laurentienne*, *Flora of New Brunswick*, *Flora of Nova Scotia* or *Plants of Prince Edward Island*.

[5] Found from St. Mary's Bay to Northumberland shore in Nova Scotia and along the east coast and Bay of Fundy shores in New Brunswick.

[6] Common, especially in the east and along the Bay of Fundy in Nova Scotia, and near settlements in New Brunswick.

Scientific Name	Common Name	Status	Previous Records	Western	Central	Schooner
Betula populifolia	Grey Birch	C,N	2,3,4,7	X	X	X
Bidens cernua	Nodding Bur-marigold	C,N	7			
Bidens frondosa	Common Beggar's-ticks	C,N	2,3,4	X		X
Botrychium matricariaefolium	Grape Fern	R,N	7	X		
Botrychium multifidum	Grape Fern	R,N	3,7	X		X
Brassica rapa	Turnip	U,I	3			
syn: Brassica napobrassica						
Bromus inermis	Smooth Brome Grass	C,I		X		
Cakile edentula	American Sea Rocket	C,N	2,3,4,5,7	X	X	X
Calamagrostis canadensis	Blue-joint	C,N	3,7	X		X
Calamagrostis stricta	Joint Grass	RR,N	3			
syn: Calamagrostis inexpansa						
Caltha palustris	Marsh Marigold	C,N	3			X
Calystegia sepium	Field Bindweed	C,N	3,5,7	X	X	X
syn: Convolvulus sepium						
Capsella bursa-pastoris	Shepherd's Purse	C,I	3	X	X	
Cardamine pensylvanica	Bittercress	U,N	5			
Carex arctata	Sedge	C,N	3			
Carex bebbii	Sedge	U,N	7			
Carex brunnescens	Sedge	C,N	3,7	X		
Carex canescens	Sedge	C,N	7	X		
Carex crinata	Sedge	C,N				X
Carex cumulata	Sedge	RR, N	2,3,4			
Carex debilis	Sedge	C,N				X
Carex deflexa	Sedge	RR,N	7			
Carex disperma	Sedge	U,N		X		
Carex hormathodes	Sedge	*[7],N		X		
Carex intumescens	Sedge	U,N		X		X
Carex leptonervia	Sedge	C,N	6			
Carex limosa	Sedge	RR,N			X	X
Carex palaecea	Sedge	C,N	1,2,3,4	X	X	X
Carex projecta	Sedge	C,N		X		
Carex pseudo-cyperus	Sedge	C,N	3,5,7	X		X
Carex retrorsa	Sedge	U,N				X
Carex rostrata	Sedge	U,N				X
Carex silicea	Sedge	C,N	7	X		
Carex stipata	Sedge	C,N				X
Carex tonsa	Sedge	U,N	7			
Carex trisperma	Sedge	C,N		X		
Carex wiegandii	Sedge	RR,N		X		
Cerastium arvense	Field Chickweed	C,I		X		
Cerastium vulgatum	Mouse-ear Chickweed	C,N	3,7	X		
Chamaedaphne calyculata	Leatherleaf	C,N	2,3,4,5		X	X
Chenopodium album	Lambs Quarters	C,I	2,3,4	X	X	
Chenopodium gigantospermum	Goosefoot	*[8],N	7			
Chenopodium macrocalycium	Goosefoot	RR,N		X		
Chenopodium rubrum	Blite	R,I		X		

[7] Common in Nova Scotia and New Brunswick.

[8] Not listed in *Flora of Nova Scotia*, rare in New Brunswick.

Scientific Name	Common Name	Status	Previous Records	Western	Central	Schooner
Cicuta bulbifera	Bulbous Water Hemlock	C,N	3,4,7	X		X
Circaea alpina	Small Enchanters Nightshade	C,N	7	X		X
Cirsium arvense	Canada Thistle	C,I	3,7	X	X	X
Cirsium vulgare	Bull Thistle	C,I		X		
Clintonia borealis	Blue Bead Lily	C,N	3,7	X	X	X
Comandra umbellata	Bastard Toadflax	RR,N			X	
Comptonia peregrina	Sweet Fern	C,N	2,3,4	X	X	X
Conyza canadensis	Horseweed	C,I	7	X		
syn: Erigeron canadensis						
Coptis trifolia	Goldthread	C,N	3,6,7	X	X	X
Corallorhiza maculata	Coral Root	U,N				X
Corallorhiza trifida	Coral Root	U,N	3			
Corema conradii	Broom Crowberry	RR,N	5			
Coriandrum sativum	Coriander	*[9],I	2,4			
Cornus canadensis	Bunchberry	C,I	2,3,4,6,7	X	X	X
Cornus rugosa	Round-leaved Dogwood	*[10], N		X		
Cornus sericea	Red Osier Dogwood	C,N		X		X
syn: Cornus stolonifera						
Corylus cornuta	Beaked Hazelnut	C,N				X
Crategus flabellata	Hawthorne	*[11],N	6, 7	X		
syn: Crataegus macrosperma						
Crysanthemum leucantheum	Ox-eye Daisy	C,I	5	X	X	X
Cypripedium acaule	Lady's Slipper	C,N	7	X	X	X
Danthonia spicata	Wire Grass	C,N	7	X		
Daucus carota	Wild Carrot	C,I		X		
Dennstaedtia punctilobula	Hay Scented Fern	C,N	3,6,7	X	X	X
Deschampsia flexuosa	Common Hair Grass	C,N	7	X		X
Dianthus armeria	Deptford Pink	R,I		X		
Dichanthelium sp.		U,N		X		
Diphasiastrum complanatum	Ground Pine	U,N		X		
syn: Lycopodium complanatum						
Diphasiastrum digitatum	Ground Pine	C,N	3	X		X
syn: Lycopdium digitatum, L. flabelliforme						
Diphasiastrum tristachyum	Ground Pine	R,N	7	X		
syn: Lycopodium tristachyum						
Drosera rotundifolia	Sundew	C,N		X		X
Dryopteris cristata	Crested Wood Fern	C,N		X		X
Dryopteris spinulosa	Spinulose Wood Fern	C,N	3,6,7	X	X	X
Elatine minima	Waterwort	RR,N	1,2,3,4	X		
Eleocharis halophila	Spike Rush	C,N	2,3,4			
Eleocharis obtusa	Spike Rush	U,N	7			
Eleocharis palustris	Spike Rush	U,N	2,3			
syn: Eleocharis smallii						
Eleocharis sp.	Spike Rush	*,N		X		
Elymus mollis	Sea Lime Grass	U,N		X		

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[9] Found occassionally as an escape in Nova Scotia, not listed in *Flora of New Brunswick*.

[10] Recorded in Bain, 1890; Erskine suggest PEI lacks the habitat for this species.

[11] Uncommon in Nova Scotia, common in southern New Brunswick.

Scientific Name	Common Name	Status	Previous Records	Western	Central	Schooner
Empetrum atropurpureum	Red Crowberry	U,N	3,7	X		X
Empetrum nigrum	Black Crowberry	C,N	3,5,7	X		
Epigaea repens	Mayflower	C,N	7	X	X	X
Epilobium adenocaulon	Willow Herb	C,N	3,7			
syn: Epilobium glandulosum						
Epilobium angustifolium	Fireweed	C,N	2,3,4,6,7	X	X	X
Epilobium ciliatum	Willow Herb	C,N	3,7	X		X
Epilobium hirsutum	Willow Herb	*,N		X		
Epilobium leptophyllum	Willow Herb	C,N	2,3,4			
Epilobium palustre	Willow Herb	C,N	2,3,4,7	X	X	X
Equisetum arvense	Field Horsetail	C,N	3,5	X	X	X
Equisetum fluviatile	Horsetail	C,N				X
Equisetum litorale	Horsetail	*,*[12]	3			
Equisetum sylvaticum	Wood Horsetail	C,N				X
Erechtites hieracifolia	Fireweed	RR,N		X		
Erigeron hyssopifolius	Hyssop-leaved Fleabane	*[13],N	3			
Erigeron strigosus	Daisy Fleabane	C,N	7	X	X	
Eriocaulon aquaticum	Pipewort	RR,N				X
Erucastrum gallicum	Dog Mustard	R,I		X		
Eupatorium maculatum	Joe-pye Weed	C,N				X
Euphrasia offininalis	Eyebright	C,N	3	X		
syn: Euphrasia americana, Euphrasia rigidula						
Euthamia graminifolia	Narrow-leaved Goldenrod	C,N	2,3,4,7	X	X	X
syn: Solidago graminifolia						
Fagus grandifolia	Beech	C,N				X
Festuca ovina	Sheep Fescue	R,I	3			
Festuca rubra	Red Fescue	C, N&I	7			
Fragaria vesca	Wood Strawberry	*[14],N		X		
Fragaria virginiana	Wild Strawberry	C,N	2,3,4,5,7	X	X	X
Fraxinus americana	White Ash	R,N				X
Galeopsis tetrahit	Hemp Nettle	C,I	3,7	X		
Galium aparine	Cleavers	C,I			X	X
Galium asperellum	Bedstraw	C,N				X
Galium boreale	Bedstraw	*[15],N	5			
Galium mollugo	Bedstraw	R,I	3,7	X	X	
Galium palustre	Bedstraw	C,N	2,3,4,6	X	X	X
Galium trifidum	Bedstraw	C,N	3,7	X		
Galium triflorum	Bedstraw	C,N	3	X	X	X
Gaultheria hispidula	Creeping Snowberry	C,N				X

[12] Considered a hybrid of E. arvense and E. palustre by *Flore Laurentienne* and of E.arvense and E. fluviatile by *Flora of Nova Scotia* and *Flora of New Brunswick*.

[13] Uncommon in Nova Scotia, locally common in southeast and northern New Brunswick.

[14] Occasional in Nova Scotia, common in St. John River Valley but uncommon elsewhere in New Brunswick.

[15] Local in Cumberland, Annapolis and Kings Counties in Nova Scotia and uncommon in New Brunswick.

Scientific Name	Common Name	Status	Previous Records	Western	Central	Schooner
Gaultheria procumbens	Wintergreen	C,N			X	X
Gaylussacia baccata	Huckleberry	C,N	5			
Geum laciniatum	Avens	RR,N				X
Glaux maritima	Sea Milkwort	C,N	7	X		X
Glyceria borealis	Manna Grass	RR,N	7			
Glyceria pallida	Manna Grass	*[16],N	3			
Glyceria striata	Manna Grass	C,N	7			
Glyceria sp.	Manna Grass			X		
Gnaphalium obtusifolium	Povertygrass	RR,N	7			
Gnaphalium uliginosum	Cudweed	C,I	2,4	X	X	X
Gymnocarpum dryopteris	Oak Fern	C,N	3,7	X		X
syn: Dryopteris disjuncta, D. linnaeana, Thelypteris dryopteris						
Helianthus annus	Sunflower	R,I		X		
Heracleum lanatum	Cow Parsnip	U,N	5			
Hieracium aurianticum	Orange Hawkweed	C,I		X	X	X
Hieracium casepitosum	Hawkweed	C,I	5	X		
Hieracium canadense	Canada Hawkweed	RR,N	7			
Hieracium floribundum	Yellow Hawkweed	U,I	2,3,4,7	X	X	X
Hieracium pilosella	Mouse-eared Hawkweed	C,I	2,3,4,7	X	X	X
Hieracium piloselloides	Hawkweed	*[17],I	7	X	X	X
syn: Hieracium florentinum						
Hieracium scabrum	Rough Hawkweed	U,N	3	X		
Hierochloe odorata	Sweetgrass	U,N		X	X	
Hippuris vulgaris	Mare's Tail	U,N	2,3,4,7	X		X
Honckenya peploides	Seabeach Sandwort	U,N	1,2,3,4,5	X	X	X
syn: Arenaria peploides						
Hordeum vulgare	Barley	C(cult.) R(wild),I	3			
Hudsonia tomentosa	Woolly Hudsonia	RR,N	2,3,4,5,7	X	X	
Hypericum boreale	St. John's Wort	C,N	1,2,3,4			
Hyperium elliptcum	St. John's Wort	*[18],N		X		
Hypericum perforatum	St. John's Wort	C,I	7	X		
Ilex verticillata	Holly	C,N	3,7	X	X	X
Impatiens capensis	Touch-me-not	C,N	2,3,4,5,7			X
syn: Impatiens biflora						
Iris versicolor	Blue Flag Iris	C,N	2,3,4,5,7	X	X	X
Juglans cinerea	Butternut	*,N				X
Juncus alpinoarticularis	Rush	U,N		X		
syn: J. alpinus var. rariflorus						
Juncus articulatus	Rush	C,N	2,3,4,7	X		
Juncus articus	Rush	C,N	2,3,4,5,7	X	X	X
syn: Juncus balitcus						
Juncus brevicaudatus	Rush	C,N		X		
Juncus bufonius	Rush	C,N	2,3,4,7	X		
Juncus canadensis	Rush	R,N		X		

[16] Listed as rare and restricted to Western Quebec in *Flore Laurentienne*, not listed in *Flora of Nova Scotia* or *Flora of New Brunswick*.

[17] Common in Nova Scotia and New Brunswick.

[18] Common in southwest and central Nova Scotia, common in New Brunswick.

Scientific Name	Common Name	Status	Previous Records	Western	Central	Schooner
Juncus compressus	Rush	R,N	2,4			
Juncus effusus	Rush	C,N	2,3,4	X		X
Juncus militaris	Rush	RR,N				X
Juncus pelocarpus	Rush	U,N	1,2,4	X		
Juncus tenuis	Rush	C,N	7	X		
Juniperus communis	Common Juniper	U,N	2,3,4,6,7	X	X	X
Juniperus horizontalis	Creeping Juniper	U,N	2,3,4	X		
Kalmia angustifolia	Sheep Laurel	C,N	3,5,7	X	X	X
Kamlia polifolia	Pale Laurel	C,N				X
Lactuca biennis	Tall Blue Lettuce	C,N	3,7	X		X
Lactuca canadensis	Blue Lettuce	U,N	3			
Larix laricina	Larch	C,N	2,3,4	X	X	X
Lathyrus japonicus	Beach Pea	C,N	2,3,4,5,7	X		X
Lechea intermedia	Pinweed	U,N	3,7			
Ledum groenlandicum	Labrador Tea	C,N	5,7	X		X
Lemna minor	Duckweed	C,N				X
Leontodon autumnalis	Fall Dandelion	C,I	2,3,4,5,7	X	X	X
Ligusticum scothicum	Scotch Lovage	U,N		X	X	X
Limosella subulata	Mudwort	U,N	2,3,4,7	X		
Linnaea borealis	Twinflower	C,N	2,3,4,6,7	X	X	X
Linnaria vulgaris	Toadflax	C,I	3	X	X	
Lobelia dortmanna	Water Lobelia	RR,N				X
Lonicera canadensis	Honeusuckle	C,N				X
Lotus corniculatus	Bird's Foot Trefoil	R,I		X	X	
Luzula acuminata	Wood Rush	U,N	3,7	X	X	X
Luzula multiflora	Common Wood Rush	C,N		X		
syn: Luzula campestris						
Lycopodium annotinum	Club Moss	C,N	6,7	X		X
Lycopodium clavatum	Club Moss	C,N	3,6,7	X		
Lycopodium hickeyi	Club Moss	*[19],N		X		
syn: Lycopodium obscurum var. isophyllum						
Lycopodium obscurum	Club Moss	C,N	3,6,7	X		X
Lycopodium sabinaefolium	Club Moss	U,N	3,7			
Lycopodium sitchense	Club Moss	*,N	7			
Lycopus americanus	Water Horehound	C,N		X	X	X
Lycopus uniflorus	Water Horehound	C,N	1,2,3,4			
Lycopus virginicus	Horehound	*,*[20]	5			
Lysimachia terrestris	Loosestrife	C,N	1,2,3,4,7	X	X	X
Lysimachia thyrsiflora	Water Loosestrife	C,N	3,7	X		
Maianthemum canadense	Lily-of-the-Valley	C,N	3,5,6,7	X	X	X
Malaxis unifolia	Green Adders Mouth Orchid	R[21],N	7	X		
Malva moschata	Musk Mallow	C,I		X		
Matricaria maritima	Mayweed	C,I		X		

[19] Distribution unknown in Nova Scotia as collections of *Lycopodium obscurum* may belong to this species. Not listed for New Brunswick.

[20] Specific name not listed in *Flore Laurentienne*, *Flora of Nova Scotia*, *Flora of New Brunswick* or *Plants of Prince Edward Island*.

[21] Not listed in Erskine; rare status for PEI from three stations in Roland & Smith.

Scientific Name	Common Name	Status	Previous Records	Western	Central	Schooner
Matricaria matricariodes	Pineapple Weed	C,I		X	X	
Matteucia struthiopteris	Ostrich Fern	C,N				X
Medicago sativa	Alfalfa	C,I		X		
Melampyrum lineare	Cow Wheat	U,N	3,7	X	X	X
Melilotus alba	White Sweet Clover	C,I		X		
Mentha arvensis	Mint	C, N/I	5	X		X
Mentha spicata	Mint	R,I		X		
Menyanthes trifoliata	Buckbean	U,N		X		X
Mimulus ringens	Monkeyflower	RR,N	2,3,4,5			
Moneses uniflora	Shinleaf	U,N	3	X		X
Monotropa uniflora	Indian Pipe	U,N	2,4,6,7	X	X	X
Myosotis laxa	Small Forget-me-not	U,N				X
Myrica gale	Sweet Gale	C,N	2,3,5,7	X	X	X
Myrica pensylvanica	Bayberry	C,N	2,3,4,5,6,7	X	X	X
Myriopyllim spicatum	Eurasian Water Milfoil	*,I				X
Nemopanthus mucronata	False Holly	C,N	3,7	X	X	X
Nuphar variegatum	Cow Lily	U,N	2,3,4			X
Odontites serotina	Red Bartsia	U,I		X		
Oenothera biennis	Evening Primrose	C,N	2,3,4,7	X	X	X
Oenothera parviflora	Small-flowered Evening Primrose		RR,N 3,7			
Onoclea sensibilis	Sensitive Fern	C,N	5,7	X	X	X
Oryzopsis asperifolia	Rice Grass	RR,N	3			
Osmunda cinnamomea	Cinnamon Fern	C,N	2,3,4,5,6,7	X	X	X
Osmunda claytoniana	Interrupted Fern	C,N	3,7	X		X
Oxalis stricta	Wood Sorrel	C,N		X	X	X
Panicum villosissimum	Panic Grass	U,N	3,7			
syn: Panicum subvillosum						
Panicum sp.	Panic Grasws			X		
Phalaris arundinacea	Reed Canary Grass	R,I		X		
Phegopteris connectilis	Beech Fern	C,N	3,7	X	X	X
syn: Dryopteris phegopteris, Thelypteris phegopteris						
Phleum pratense	Timothy	C,I	3	X	X	X
Picea glauca	White Spruce	C,N	2,3,4,5,6,7	X	X	X
Picea mariana	Black Spruce	C,N	3	X		X
Picea rubens X mariana	Red Spruce	U,N		X	X	X
Pinus strobus	White Pine	C,N	5			
Plantago lanceolata	Lance-leaved Plantain	U,I		X	X	
Plantago major	Common Plantain	C,I	3	X		X
Plantago maritima	Seaside Plantain	R,N	5,7	X		X
syn: Plantago juncoides						
Plantathera clavellata	Northern Club-spur	U,N	7	X		
syn: Habenaria clavellata						
Plantathera lacera	Ragged Orchid	C,N		X		X
Plantathera psychodes	Purple Fringed Orchid	C,N		X		
Poa annua	Annual Speargrass	U,I	3			
Poa compressa	Canada Bluegrass	C,I	7			
Poa palustris	Fowl Meadow-grass	C,I		X		
Poa pratensis	Kentucky Bluegrass	C,I	3,7			
Polygonum amphibium	Water Smartweed	U,N	3,7	X		
Syn: Polygonum natans						
Polygonum arenastrum	Knotweed	*,I		X		
Polygonum cilinode	Knotweed	R,N	3	X		X
Polygonum convolvulus	Wild Buckwheat	U,I	6,7	X	X	X

Scientific Name	Common Name	Status	Previous Records	Western	Central	Schooner
Polygonum hydropiper	Water Pepper	C,N		X		X
Polygonum lapathafolium	Knotweed	C,I				X
Polygonum persicaria	Lady's Thumb	U,I	2,3,4,7	X	X	X
Polygonum sagittatum	Tear Thumb	C,N	2,3,4		X	X
Populus grandidentata	Large-toothed Aspen	C,N	7	X		X
Populus tremuloides	Poplar	C,N	2,3,4,6,7	X	X	X
Potamogeton epihydrus	Pondweed	R,N	7			
Potamogeton natans	Pondweed	U,N		X		X
Potamogeton spirillus	Pondweed	*[22],N	7			
Potamogeton sp.	Pondweed			X		
Potentilla anserina	Silverweed	C,N	2,3,4,7	X	X	X
Potentilla argentia	Silvery Cinquefoil	C,I		X		
Potentilla norvegica	Cinquefoil	C,I			X	X
Potentilla palustris	Marsh Cinquefoil	C,N	2,3,4,5,7	X	X	X
Potentilla recta	Cinquefoil	U,I		X	X	
Potentilla tridentata	Three-toothed Cinquefoil	C,N	2,3,4,5	X	X	X
Prenanthes altissima	White Lettuce	U,N				X
Prenanthes trifoliolata	Lion's Paw	C,N	5,7	X	X	X
Prunella vulgaris	Heal All	C,I		X		
Prunus cerasus	Sour Red Cherry	R,I	3			
Prunus pensylvanica	Choke Cherry	C,N	3,6,7	X	X	X
Prunus virginiana	Pin Cherry	C,N	2,3,4	X	X	X
Pteredium aquilinum	Bracken	C,N	2,3,4,6,7	X	X	X
Pyrola elliptica	Pyrola	C,N	7	X		X
Pyrola rotundifolia	Round-leaved Pyrola	U,N	6	X		X
Pyrola secunda syn: Orthilia secunda	One-sided Pyrola	U,N	6	X	X	X
Pyrus malus	Apple	C,N	3,6	X		
Quercus rubra	Red Oak	U,N	6	X		
Ranunculus acris	Tall Buttercup	C,I		X	X	
Ranunculus cymbalaria	Seashore Buttercup	C,N	1,2,3,4,7	X		
Ranunculus repens	Creeping Buttercup	C,I		X	X	X
Raphanus raphanistrium	Wild Radish	C,I		X		
Rhianthus crista-galli	Yellow Rattle	U,N			X	
Rhododendron canadense	Rhodora	C,N	3,4,5,7	X	X	X
Ribes glandulosum	Skunk Currant	U,N	6	X		X
Ribes hirtellum	Gooseberry	C,N	2,3,4,6,7	X	X	X
Ribes lacustre	Black Currant	C,N	3,7	X		X
Rorippa nasturtium aquaticum	Water Cress	U,I				X
Rorippa sylvestris	Yellow Cress	R[23],I	7			
Rosa cinnamomea	Cinnamon Rose	U,I	2,3,4			
Rosa rugosa	Rugose Rose	U,I		X		X
Rosa virginiana	Common Wild Rose	C,N	3,5,6,7	X	X	X
Rubus allegheniensis	Common Blackberry	U,N				X
Rubus hispidus	Swamp Dewberry	U,N	3,7	X		X
Rubus ideaus syn: Rubus strigosus	Raspberry	C,I	2,3,4,5,6,7	X	X	X

[22] Common in Nova Scotia, scattered and more common toward the south in New Brunswick.

[23] Erskine indicates a single station in Charlottetown, but says eradicated with 2,4-D.

Scientific Name	Common Name	Status	Previous Records	Western	Central	Schooner
Rubus pubescens	Dewberry	C,N		X		X
Rubus recurvicaulis	Blanchard's Dewberry	•[24],N		X		
Rudbeckia hirta	Brown-eyed Susan	C,I		X		
Rumex acetosella	Sheep Sorrel	C,I	2,3,4,5,7	X	X	X
Rumex crispus	Dock	C,I	3,5	X	X	X
Rumex domesticus	Dock	R,I	1,2,3,4			
Rumex maritimus	Dock	RR,N	2,3,4,7			X
Rumex mexicanus	Dock	R,I	2			
Rumex orbiculatus	Dock	C,N	3,7			
Rumex salicifolius	Dock	•[25],N	3,4			
syn:Rumex triangulivalvis						
Sagina nodosa	Pearlwort	RR,N	7			
Sagina procumbens	Pearlwort	U,N	7	X		
Sagittaria cuneata	Northern Arrowhead	•[26],N	7			
Sagittaria latifolia	Common Arrowhead	U,N	1,2,3,4,5,7	X		X
Salicornia europaea	Glasswort	U,N		X		
Salix bebbiana	Willow	C,N	3,7			
Salix discolor	Willow	C,N	1,2,3,4,7			
Salix humulis	Willow	U,N	7			
Salsola koli	Saltwort	R,N		X		
Sambucus canadensis	Common Elder	C,N	3	X	X	X
Sambucus racemosa	Red-berried Elder	C,N	3,6,7	X	X	X
syn: Sambucus pubens						
Scirpus acutus	Bulrush	U,N	3			
Scirpus americanus	Bulrush	C,N	2,3,4	X	X	X
Scirpus atrocinctus	Bulrush	C,N		X		
Scirpus atrovirens	Bulrush	R,N	2,3,4,7	X		X
Scirpus cyperinus	Bulrush	C,N	7	X	X	X
Scirpus maritimus	Bulrush	U,N	2,3,4,7	X	X	X
Scirpus paludosus	Bulrush	R,N	2,4			
Scirpus rubrotinctus	Bulrush	C,N	5			
Scirpus validus	Bulrush	C,N	2,7	X		X
Scutellaria galericulata	Marsh Skullcap	C,N	1,2 3,4	X		X
syn: Scutellaria epilobiifolia						
Scutellaria lateriflora	Skullcap	C,N		X		X
Senecio jacobaea	Tansy Ragwort	C,I	5,7	X	X	
Senecio sylvaticus	Ragwort	U,I	3			
Senecio vulgaris	Common Groundsel	U,I	1,2,4,7	X		
Setaria viridis	Green Fox-tail Grass	U,I		X		
Silene vulgaris	Bladder Campion	U,I		X		
syn: Silene cucubalus						
Sisymbrium altissimum	Tumble Mustard	C,I		X		
Sisyrinchium montanum	Blue-eyed Grass	C,N		X		X
Sium suave	Water Parsnip	C,N	2,3,4,5,7	X		

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[24] Common in southwestern Nova Scotia, not confirmed in New Brunswick.

[25] Uncommon to rare in Nova Scotia, scattered to locally common in New Brunswick.

[26] Common in Cape Breton, and present in Kings and Cumberland Counties, Nova Scotia. Common in New Brunswick.

Scientific Name	Common Name	Status	Previous Records	Western	Central	Schooner
Smilacina stellata	Starry False Soloman's Seal	U,N		X		
Solanum dulcamara	Nightshade	R,I	3	X		X
Solanum tuberosum	Potato	C(cult)	R(wild),I 3			
Solidago altissima	Goldenrod	RR,N	7			
X Solidago asperula (S. sempervirens X. rugosa)	Goldenrod	R,N	7			
Solidago bicolor	White Goldenrod	U,N	2,3,4,7	X		X
Solidago canadensis	Canada Goldenrod	C,N	7	X	X	
Solidago puberula	Rough Goldenrod	C,N	2,3,4,7	X		
Solidago rugosa	Rough Goldenrod	C,N	2,3,4,5,6,7	X	X	X
Solidago sempirvirens	Seaside Goldenrod	U,N	2,3,4,5,7	X	X	X
Sonchus arvensis	Perennial Sow Thistle	C,I	3,5	X	X	X
Sonchus asper	Spiny Sow Thistle	R,I	1,2,3,4			
Sonchus oleraceus	Annual Sow Thistle	U,I	5,7			
Sorbus americana	Mountain Ash	C,N	3,7	X	X	X
Sparganium americanum	Bur-reed	R,N	2,3,4	X		
Sparganium angustifolium	Bur-reed	U,N	7	X		X
Sparganium chlorocarpum	Bur-reed	C,N	2,3,4,7			X
Sparganium eurycarpum	Giant Bur-reed	C,N	2,3,4,7	X	X	X
Sparganium fluctuans	Bur-reed	R,N	2,3,4			
Spartina alterniflora	Cord Grass	C,N	2,3,4	X		
Spartina patens	Salt Hay	U,N		X	X	
Spartina pectinata	Fresh Water Cord Grass	C,N	2,3,4,7	X	X	X
Spergula arvensis	Spurry	C,I		X		
Spergularia marina	Sand Spurry	U,N		X		
Spergularia rubra	Sand Spurry	U,I	3	X		
Spiranthes lacera	Lady's Tresses	C,N	1,2,3,4,7	X		
Spiranthes romanzoffiana	Hooded Lady's Tresses	C,N	7	X		
Spirea alba syn: Spirea latifolia	Meadowsweet	C,N	2,3,4,5,7	X	X	X
Stellaria graminea	Grass-leaved Stitchwort	C,I		X		
Streptopus amplexifolius	Green Twisted-stalk	C,N		X	X	X
Streptopus roseus	Red Twisted-stalk	C,N	7	X		X
Suaeda maritima	Sea-blite	U,N		X		
Tanacetum vulgare	Tansy	U,I		X		
Taraxacum officinale	Dandelion	C,I	3,7	X		
Taxus canadensis	Ground Hemlock	C,N				X
Thalictrum pubescens syn: Thalictrum polygamum	Meadowrue	C,N	5			X
Thelypteris noveboracensis syn: Dryopteris noveboracensis	New York Fern	U,N	7	X		X
Thymus serphyllum	Thyme	U,I		X		
Toxicodendron radicans syn: Rhus radicans	Poison Ivy	U,N	2,3,4,7	X		X
Tragopogon pratensis	Goat's Beard	U,I		X	X	
Triadenum fraseri syn: Hypericum virginicum	Marsh St. John's Wort	C,N	1,2,3,4,7	X		X
Trientalis borealis	Starflower	C,N	3,6,7	X	X	X
Trifolium arvense	Rabbitsfoot Clover	U,I		X	X	X
Trifolium aureum syn: Trifolium agrarium	Clover	C,I	7	X		
Trifolium campestre syn: Trifolium procumbens	Low Hop Clover	C,I		X	X	X

Scientific Name	Common Name	Status	Previous Records	Western	Central	Schooner
Trifolium pratense	Red Clover	C,I		X	X	
Trifolium repens	Creeping White Clover	C,I	7	X	X	
Triglochin maritima	Arrow Grass	C,N	7	X	X	X
syn: Triglochin elata						
Trillium cernuum	Painted Trillium	C,N				X
Triticum aestivum	Wheat	C(cult.)	R(wild), 1 3			
Typha angustifolia	Narrow-leaved Cat-tail	RR,N	7	X		X
Typha latifolia	Cat-tail	C,N	2,3,4,5,7	X	X	X
Ulmus americana	Elm	C,N				X
Vaccinium angustifolium	Blueberry	C,N	2,3,4,6,7	X	X	X
Vaccinium corymbosum	High Bush Blueberry	*[27],N	5			
Vaccinium macrocarpon	Cranberry	U,N	2,3,4,5,7	X	X	X
Vaccinium myrtilloides	Velvet-leaf Blueberry	C,N	2,4			
Vaccinium oxycoccus	Small Cranberry	U,N	5	X		X
Veronica officinalis	Common Speedwell	U,I		X	X	X
Veronica scutellata	Marsh Speedwell	RR,N	1,2,4			
Viburnum cassinoides	Wild Raisin	C,N	2,3,4,5,6,7	X	X	X
Viburnum opulus	Highbush Cranberry	C,N				X
Vicia angustifolia	Common Vetch	C,I	7			
Vicia cracca	Tufted Vetch	C,I	3	X	X	X
Vicia sativa	Cultivated Vetch	R,I		X	X	
Viola cucullata	Blue Violet	C,N	3	X	X	
Viola macloskeyi	Small White Violet	C,N	3,6,7			
syn: Viola pallens						
Viola septentrionalis	Violet	R,N	3			
Viola tricolor	Johnny Jump-up	*[28],I		X		

[27] Erskine indicates that previous researchers have listed *Vaccinium angustifolium* var. *laevifolium* as *V. corymbosum*. It is not clear which was intended in survey #5 by Campbell, Westaway, MacIntyre and Gillis.

[28] Scattered in Nova Scotia and known from Fredericton, Woodstock and Kouchibouguac National Park, New Brunswick.

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- offrir des publications professionnelles, crédibles et précises qui seront soumises à l'évaluation par les pairs.
- favoriser la diffusion de l'information, la créativité, l'efficacité et le travail d'équipe dans les projets de recherche.

Évaluation par les pairs
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